THE UNSTALKED CRINOIDS OF THE SIBOGA EXPEDITION

Siboga-Expeditie
XLII b

THE UNSTALKED CRINOIDS OF THE SIBOGA EXPEDITION

BY

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With XXVIII plates and 17 text figures

LATE E. J. BRILL
PUBLISHERS AND PRINTERS
LEYDEN — 1918

INTRODUCTION.

PREFACE.

The privilege and pleasure of studying the wonderfully rich collection of unstalked crinoids brought home by the "Siboga" I owe to the courtesy and generosity of my friend Professor RENÉ KOEHLER. While I was visiting him at Lyons in the summer of 1910 he showed me, among many interesting things, an extraordinary assemblage of comatulids from the East Indies, which he said he would be glad to turn over to me if I cared to study them. Naturally I hesitated at depriving him of the opportunity offered by this material for the elucidation of many obscure points in regard to the East Indian crinoid fauna, but with his characteristic unselfishness he insisted that I should undertake the work.

Much of the satisfaction which I have derived from the present study has been due to the fact that my friend Professor LUDWIG DÖDERLEIN prepared the companion volume upon the stalked crinoids, and I have been keenly appreciative of the honour of being thus associated with him.

SCOPE OF THE PRESENT WORK.

In a recently published memoir entitled "Crinoids of the Indian Ocean" (Calcutta, 1912) I brought together all the information regarding the crinoids of the Indo-Pacific region, and included an historical introduction and a complete bibliography. The present work is essentially a refinement of the preceding. Every family, genus and species has been reëxamined, and new keys have been prepared for all of the subfamilies, genera and species. In spite of the great amount of new material, relatively few changes have been found necessary, and these changes fall chiefly in the very difficult family Antedonidae.

Every comatulid genus is mentioned, though the extralimital are as a rule not treated in detail. It has seemed advisable, however, to include keys to the species of the genus *Antedon* of the middle and northeastern Atlantic, of *Leptometra* of the east and northeast Atlantic, of *Coccometra* of the Caribbean region and of *Florometra* of the east and north Pacific in order to emphasize their similarity, and the similarity of their internal interrelationships, to the corresponding East Indian types, *Mastigometra* and *Euantedon*, *Psathyrometra*, *Thysanometra* and *Cyclometra*.

It will be noticed that the treatment of the different families varies slightly, some being considered in greater detail than others. It has not seemed necessary to treat the relatively well known groups with that minuteness which is called for in the case of the more obscure and difficult families.

In the lists of the species by stations the stalked species described bij Professor DÖDERLEIN are included. The species of the family Bourgueticrinidae (*minimus*, *nodipes*, *poculum* and *weberi*) are assigned to genera in accordance with my recent revision of that family, in "Die Crinoiden der Antarktis" (Berlin, 1915), and the new species of *Isocrinus* (*Sibogae*) is assigned to the genus *Endoxocrinus*, *Isocrinus* as now understood, both by Professor DÖDERLEIN and myself, being exclusively West Indian.

The references to the literature include all in which original matter occurs, but those in which no original matter is found are omitted.

THE "SIBOGA" COLLECTION.

Of all the collections made by exploring expeditions since the time of the "Challenger" that of the "Siboga" excels in the number of species and of individuals, and in the number and diversity of those small forms too often discarded as the "young" of the larger types.

In making this statement I am assuming that comparison with the collections of the "Albatross" would not be quite fair, as that ship took her first dredge haul on March 22, 1883 and has been almost continuously at work ever since, that is to say for a period of nearly thirty-four years, cruising throughout the western Atlantic and Caribbean regions, and over the greater part of the Pacific, and spending the time from November 7, 1907 to January 29, 1910 among the Philippine Islands and in adjacent waters, where she covered a part of the territory previously worked by the "Siboga".

The route traversed by the "Siboga" carried her over what is possibly the most interesting region, zoögeographically speaking, in the whole world; she gathered the Australian fauna at the Aru Islands, and the Malayan fauna in the Sulu archipelago, and paid particular attention to the intermediate region, among the Moluccas and about the Lesser Sunda Islands which, in water of moderate depth, possess a fauna certainly distinct from that of the Philippines and adjacent islands as we know it, and related rather to that of southern Japan, though from certain indications it may possibly be a continuation of the deeper Australian fauna which extends itself further to the northward and westward than does the fauna of the littoral.

There are known from the recent seas 576 species of crinoids, representing 142 genera distributed among 28 families and subfamilies. Of these, 76 species, included in 22 genera and 6 families, are stalked, while 500 species, 120 genera and 22 families and subfamilies are of the unstalked comatulid type.

In the course of her explorations the "Siboga" collected 163 species (149 comatulids and 14 stalked forms), of which no less than 73 (64 comatulids and 9 stalked species) were new to science, representing an increase of 14.5 percent in the number of known forms.

These 163 species fall into 71 genera (65 comatulid and 6 stalked), just over half of

all those known, of which three, all unstalked, are new. Two of these new genera are closely related to others previously described, but the third is an extraordinary and unique type.

The 71 genera are included in 21 families and subfamilies (19 comatulid and 2 stalked), all previously known.

It is often quite as interesting and instructive to consider what is lacking in a collection as what is present. The 7 families and subfamilies of which the "Siboga" did not secure representatives are:

Thysanometrinae	Apiocrinidae
Isometrinae	Phrynocrinidae
Heliometrinae	Plicatocrinidae
Holopodidae	

the first three comatulids, the last four stalked types.

Thus we still know the Holopodidae only from the Caribbean Sea, and the Isometrinae only from the Antarctic regions. A representative of the Thysanometrinae is known to occur in the region traversed by the "Siboga", where it was collected both by the "Challenger" and by the "Albatross"; its absence from the "Siboga" collection emphasizes anew the extreme difficulty of securing a complete collection of the crinoids inhabiting any one locality.

The Heliometrinae are represented by a single genus in the Indo-Pacific region which has only been reported from southwestern Japan and the Arabian Sea, a single species represented by a single specimen from each locality.

The "Challenger" dredged a single very fragmentary specimen of a species of Apiocrinidae (*Carpenterocrinus mollis*) south of Japan, and the "Albatross" a single specimen of another genus (*Proisocrinus ruberrimus*) west of Luzon. The family, though so important as a fossil, is not otherwise known from the recent seas.

The "Challenger" secured a specimen of a species of Plicatocrinidae (recorded as "? *Hyocrinus bethellianus*") in 5° 31′ N., 145° 13′ E., at a depth of 4185 Metres; the "Albatross" secured another (*Thalassocrinus pontifer*) in the Moluccas.

The Phrynocrinidae remain known only from southern Japan and the Hawaiian Islands, one genus (*Phrynocrinus* and *Naumachocrinus* respectively) from each locality; there are in existence three specimens altogether, two of one and one of the other, all three incomplete.

The genera *Democrinus*, *Bythocrinus* and *Monachocrinus* of the Bourgueticrinidae were first found in the East Indian region by the "Siboga"; but it is quite possible that the "*Rhyzocrinus*" mentioned by KOROTNEFF [1]) is *Democrinus weberi*.

For the sake of comparison it may be mentioned that the "Albatross" also failed to secure representatives of 7 families and subfamilies:

Heliometrinae	Holopodidae
Isometrinae	Bourgueticrinidae
Perometrinae	Phrynocrinidae
Tropiometridae	

1) Bull de l'Acad. roy de Belgique, sér. 3, vol. 12, 1886, p. 558.

the first four comatulids, the last three stalked, and collected only a single specimen of a single species in four others:

Thysanometrinae	Apiocrinidae
Atelecrinidae	Plicatocrinidae

Of the genera the one especially interesting type absent alike from the "Challenger", "Siboga" and "Albatross" collections, but dredged by both the "Investigator" and the "Valdivia", is *Comastrocrinus (Teliocrinus)*, a beautiful pentacrinite related to *Hypalocrinus* which ranges, so far as is now known, only from western Sumatra to the western coast of India.

The features of special interest in connection with the "Siboga" collection are thirteen in number:

1. The discovery of an entirely new type of Atelecrinidae with five arms and no basals (*Atopocrinus*).

2. The discovery of the extraordinarily small bourgueticrinoids of the genus *Monachocrinus* (*minimus* and *poculum*), a genus not heretofore known from the East Indian region.

3. The discovery of an extremely small bourgueticrinoid of the genus *Bythocrinus* (*nodipes*), a genus not heretofore known from the East Indian region.

4. The discovery of an exceedingly large bourgueticrinoid of the genus *Democrinus* (*weberi*), a genus previously known only from the Atlantic, though probably the genus referred to by Korotneff under the name *Rhyzocrinus*.

5. The discovery of a close relative of the European genus *Antedon* (*Euantedon*) which, with the allied genus *Mastigometra*, represents it in the east.

6. The discovery of a new type of the genus *Atelecrinus* with short cirri and very large basals (*Atelecrinus anomalus*).

7. The discovery of three remarkable species of *Eudiocrinus* two of which represent entirely new types, while the third represents a type hitherto only known from southern Japan.

8. The discovery of two entirely new types of the genus *Neometra* (represented by *N. diana* and *N. sibogae*), one of which has been recently found by the "Endeavour" off Western Australia.

9. The discovery of three tropical species of *Compsometra*, two of which are of extremely small size (*iris*, *longicirra* and *parviflora*).

10. The discovery of three small species of *Decametra* (*parva*, *laevipinna* and *minima*) which link this genus with *Prometra* and with *Oligometra*.

11. The discovery of three small species of *Psathyrometra* (*minima*, *inusitata* and *anomala*) which almost bridge the gap between the Zenometrinae and the Bathymetrinae.

12. The discovery of an extraordinary series of nine species in the families Comasteridae (*Capillaster gracilicirra*, *Capillaster tenuicirra*, *Comatula tenuicirra*, *Comaster sibogae*), Himerometridae (*Heterometra propinqua*), Mariametridae (*Oxymetra tenuicirra*, *Dichrometra tenuicirra*, *Mariametra tenuipes*) and Colobometridae (*Cyllometra gracilis*) all of which are very closely related to previously known types from which they differ in possessing long and slender long-segmented cirri; all but *Oxymetra tenuicirra*, *Mariametra tenuicirra* and *Cyllometra gracilis* come from the warm, shallow and muddy Java Sea.

13. The discovery of the most ornate comatulid known (*Strotometra ornatissimus*) which exhibits an exaggerated eversion of the distal edges of the brachials finding a parallel only in the pentacrinite genus *Comastrocrinus*.

ZOÖGEOGRAPHICAL RELATIONSHIPS OF THE NEW SPECIES.

Most of the new species in the "Siboga" collection are more or less closely related to previously known Indo-Malayan types, and offer nothing of especial zoögeographic interest; but nine of them — a number too large to be ignored — from the Lesser Sunda Islands from Sumbawa eastward, and from the Moluccas, are related not to other species from the Indo-Malayan region, but to species from southern Japan, a region possessing a well marked and distinctive fauna. In addition to these there are two others previously known which show the same zoögeographical relationships. These eleven species are:

Sumbawa-Moluccas species.	Japanese representative.
Comatulides australis	*C. decameros*
Comantheria weberi, *Comantheria rotula*	*C. intermedia*
Eudiocrinus pinnatus	*E. variegatus.*
Cyllometra gracilis	*C. albopurpurea*
Tropiometra afra (Hartlaub)	*T. macrodiscus*
Crossometra helius	*C. septentrionalis*
Perissometra timorensis	*P. lata*
Strotometra parvipinna (P. H. Carpenter)	*S. hepburniana*
Compsometra iris	*C. serrata*
Nanometra clymene	*N. bowersi*

One species from the same region is most closely related to another from Oceania:

Lesser Sunda Island species.	Oceanic representative.
Oceanometra magna	*O. gigantea*

Another is closely related to a species from Oceania and another from southern China:

Moluccan species.	Oceanic and Chinese representatives.
Euantedon moluccana	*E. tahitiensis*, *E. sinensis*

One well known species from the Lesser Sunda Islands and northern Australia (*Stephanometra indica*) occurs otherwise at Ceylon and among the islands in the southwestern Indian Ocean, having been first described from Rodriguez.

The very complete collections made by the "Siboga" at the Aru Islands have conclusively demonstrated that the crinoid fauna of those island is purely and typically Australian, differing widely from that of the islands to the west and northwest.

ANNOTATED LIST OF SPECIES.

THE COMATULIDS.

1st. Suborder OLIGOPHREATA.

I. Family COMASTERIDAE A. H. Clark.

Key to the Subfamilies of the Family Comasteridae.

a^1 Cirri present

b^1 the distal cirrus segments bear dorsal processes

c^1 ten or more arms; if there are more than 10 arms the division series may be all 2, in which case the first two brachials of the outer arms are united by pseudosyzygy and the second and third by syzygy; or the IIBr series may be 4 (3 + 4) and the following series 3 (2 + 3), in which case the first brachial of the free arms (and the first ossicles of the IIIBr and following division series) bears a pinnule, and there is a syzygy between the second and third brachials; in the rare cases in which the division series are very irregular the occurrence of a pinnule on the first brachial is diagnostic . . . . . Capillasterinae

c^2 always more than 10 arms (except in the very young); some or all of the IIBr series 4 (3 + 4); following division series 4 (3 + 4) or 2; the second brachial of the free arms bears the first pinnule, and there is a syzygy between the third and fourth; in the rare cases in which all the division series are 2 the presence of a synarthry between the first and second brachials and of a syzygy between the third and fourth, and the presence of the first pinnule on the second, are diagnostic . . . . . Comasterinae

b^2 all the cirrus segments smooth, without dorsal processes; rarely more than 10 arms; if there are 10 arms the ossicles of the IBr series and the first two brachials may be united either by synarthry

or by pseudosyzygy; if there are more than 10 arms the IIBr series exactly resemble the IBr series and, as in the IBr series, the component elements are united by pseudosyzygy (instead of by synarthry as is always the case in the IIBr series of 2 in the Capillasterinae and Comasterinae) . . . . . Comactiniinae

a² No cirri

b¹ the IIBr series are 4 (3 + 4) and the following division series are 3 (2 + 3); the first brachial of the free arms bears a pinnule and there is a syzygy between the second and third; the arms are always more than 10 in number . . . . . Capillasterinae

b² the first pinnule is on the second brachial of the free arms

c¹ 10 or more arms; the ossicles of the IBr series are united by pseudosyzygy like the first two brachials; the IIBr series, when present, exactly resemble the IBr series, and are always 2; the presence of IIIBr series is very exceptional; genital pinnules composed of relatively short and broad segments Comactiniinae

c² always more than 10 arms; one or more IIIBr series always present; IIBr series mostly, or entirely, 4 (3 + 4); if 2, the component ossicles are united by synarthry; IIIBr series 4 (3 + 4), or 2, rarely 2 (1 + 2); genital pinnules composed of longer and more slender segments. . . . . Comasterinae

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1st. Subfamily Capillasterinae A. H. Clark.

Key to the Genera of the Subfamily Capillasterinae.

a¹ More than 10 arms

b¹ the first pinnule of the free arms is on the first brachial, and there is a syzygy between the second and third; IIBr series 4 (3 + 4) and following series 3 (2 + 3); occasionally the division series are very irregular

c¹ brachials much broader than long, oblong or wedge-shaped; no covering plates along the brachial and pinnule ambulacra (southeastern Africa to the Malay Archipelago and northern Australia, and northward to southern Japan) . . . . . **Capillaster**

c² brachials triangular, about as long as broad, becoming elongate wedge-shaped distally; brachial and pinnule ambulacra bordered with large covering plates (Bermuda, Florida and the Caribbean Sea, and southward to Brazil) . . **Nemaster**

b² the first pinnule of the free arms is on the second brachial; there is, at least on the outer arms, a pseudosyzygy between the first two brachials, and on all the arms there is a syzygy between the third and fourth; all the division series 2.

c¹ brachials beyond the basal wedge-shaped, broader than long (southeastern Africa to the Malay Archipelago, northern Australia, the Philippines, the Caroline Islands and southern Japan) . . . . . Comatella

c² brachials beyond the basal triangular, about as long as broad

d¹ cirri arranged in 25 closely crowded columns, usually of two each (Kei and Philippine Islands) . . . . Palaeocomatella

d² cirri arranged in irregular rows (northwestern Africa and southwestern Europe, and the Caribbean Sea) . . . . . Neocomatella

a² 10 arms

b¹ all the pinnules present

c¹ cirri moderate or slender, but never excessively so; at least the last two segments no longer than broad

d¹ first and second segments of the proximal pinnules with a very high and prominent carinate process of which the outer edge, at least on the second segment, is parallel with the longitudinal axis of the pinnule (Caribbean Sea and Gulf of Mexico) . . . . . Leptonemaster

d² no carinate process on the basal segments of the proximal pinnules

e¹ the pinnules of the first two to four pairs bear terminal combs; the combs are confined to the distal half of the pinnules and are composed of triangular teeth which are not higher than the lateral diameter of the segments which bear them; none of the segments of the proximal pinnules are more than very slightly longer than broad; there is no modification of the dorsal surface of the earlier brachials; all of the brachials, and the pinnulars, have very spinous distal borders (eastern coast of Africa to the Malay Archipelago and the Philippine Islands) . . . . . Comissia

e² terminal comb occurring only on the pinnules of the first pair (P_1 and P_a) from one or both of which it is sometimes absent; the comb usually arises about, or within, the proximal third of the pinnule, and

is composed of exceptionally large rounded teeth which usually much exceed in height the lateral diameter of the segments which bear them; the fourth-seventh brachials bear prominent spinous median knobs or keels; usually one or more of the earlier segments of P_1 twice as long as broad or longer (southeastern United States) . . . . . **Comatonia** [1])

c² cirri excessively slender and thread-like, the enormously elongated segments with greatly swollen articulations; the penultimate segment, which is much shorter than those preceding, is twice as long as broad; arms not more than 15 mm. in length (Lesser Antilles) . . . . . **Microcomatula**

b² the second, third and fourth pairs of pinnules are absent, so that there are no pinnules between P_1 and P_a, and P_5 and P_e (southeastern United States). . . . . **Comatilia**

Comatella A. H. Clark.

Key to the Species of the Genus Comatella.

a¹ Usually 26—30 cirrus segments; usually more than 40 arms; all the IIIBr series present, usually numerous IVBr, VBr and VIBr series, and sometimes VIIBr series also; the inner branch from each IIBr series and its division resembles the outer (north Australia to the Philippine Islands) . . . . . *nigra*

a² Not more than 25 cirrus segments; not more than 35 arms

b¹ usually 20—25 cirrus segments; usually 30—35 arms; IIIBr series usually present on outside of rays only; the inner branch from each IIBr series usually remains undivided (Ceylon eastward to Australia and Oceania, reaching New South Wales, Fiji, Tonga, Samoa, the Philippine Islands and China). . . . . *stelligera*

b² cirri with not more than 20 segments; usually 20 arms; IIBr series usually all, or nearly all, present, but rarely any further division

c¹ 15—20 cirrus segments (from the islands in the southwestern Indian Ocean eastward to northern Australia, New Caledonia, Rotuma, the Caroline Islands and Macclesfield Bank) . . . . . *maculata*

c² not more than 13 cirrus segments (southwestern Japan) . . . *decora*

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1) The type of this genus is *Actinometra cristata* (P. H. Carpenter MS.) Hartlaub (Mem. Mus. Comp. Zoöl., vol. 27, 1912, N°. 4, p. 473, pl. 10, figs. 1—5; pl. 15, figs. 10, 11).

HARTLAUB's specimen was without locality; the United States National Museum possesses specimens from off Cape Lookout, North Carolina, in 7½ fathoms (Cat. N°. 34634), and from near Key West Florida, in 120 fathoms (Cat. N°. 34628), and in 132 fathoms (Cat. N°. 34632).

1. *Comatella nigra* (P. H. Carpenter).

W. B. Carpenter. Proc. Roy. Soc., vol. 24, 1876, p. 451 (*Actinometra nigra*, Semper, MS.; anatomy).
Ludwig. Zeitschr. für wiss. Zool., vol. 26, 1876, p. 361 (Philippinische *Comatula*; anatomy).
P. H. Carpenter. Journ. Anat. and Physiol., vol. 10, 1876, p. 583 (*Actinometra nigra*, Semper, MS.; anatomy); vol. 11, 1876, p. 88, footnote (*idem*).
von Graff. Das Genus *Myzostoma*, 1877, pp. 17, 23, 72, 79 (*Comatula nigra*).
P. H. Carpenter. Quart. Journ. Micros. Sci., vol. 21, 1881, p. 181 (*Actinometra nigra*, Semper, MS.; anatomy).
von Graff. "Challenger" Reports. Myzostoma, 1884, pp. 16, 20 (*Actinometra nigra*).
P. H. Carpenter. "Challenger" Reports. The Stalked Crinoids, 1884 pp. 96, 110, 120, 121, 122, 124, 416; pl. 61, fig. 6 (*Actinometra nigra*; anatomy and arm sections).
P. H. Carpenter. Ann. and Mag. Nat. Hist., series 5, vol. 19, 1887, p, 39 (*Actinometra nigra*; vascular system).
P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 304 (*Actinometra nigra*; first indications of specific characters).
Koehler. Revue Suisse Zool., vol. 3, 1895, p. 293 (*Actinometra nigra*).
Pfeffer. Abhandl. der Senck. naturforsch. Ges., vol. 25, 1900, p. 85 (*Actinometra nigra*).
A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 208.
A. H. Clark. Proc. U. S. Nat. Mus., vol. 36, 1909, p. 395.
A. H. Clark. Proc. U. S. Nat. Mus., vol. 39, 1911, p. 530.
A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 68, fig. 1, p. 69.
Reichensperger, Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, part 1, pp. 82, 83.
A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N°. 15, p. 3.
H. L. Clark. Carnegie Institution of Washington Publication N°. 212, 1915, p. 101.

Stat. 43. Anchorage off Pulu Sarassa, Postillon Islands. Up to 36 Metres. 1 Ex.
Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 Metres. 1 Ex.
Stat. 282. 8° 25'.2 S., 127° 18'.4 E. 27—54 Metres. 1 Ex.
Enkhuizen Island, near Batavia, Java. 1 Ex.

The individual from Stat. 43 has 35 arms about 120 mm. long, and cirri XIV, 26—27, 25 mm. long.

This specimen may almost equally well be referred to *nigra* or to *stelligera*; in its habitus and in the details of its arm and cirrus structure it is intermediate between the two.

The specimen from Stat. 99 is small, but typical; it has about 65 arms which are about 100 mm. long, and cirri XVII, 27—32, moderately stout, 25 mm. to 28 mm. long.

The example from Stat. 282 has about 70 arms; the cirri are robust, 30 mm. long, composed of 23—25 segments.

The specimen from Enkhuizen Island has about 60 arms; there may be as many as five axillaries exteriorly; there are usually three interiorly; the cirri are XXXVIII, 23—26, large and robust, 25 mm. long.

2. *Comatella stelligera* (P. H. Carpenter).

Lütken. Cat. Mus. Godeffroy, vol. 5, 1874, p. 190 (*Actinometra tenax*, nomen nudum).
P. H. Carpenter. Journ. Linn. Soc. (Zoöl.), vol. 15, 1880, p. 198, pl. 12, fig. 26 (*Actinometra stelligera*).
Bell. Proc. Zoöl. Soc. London, 1888, p. 389, footnote (*Actinometra notata*, nomen nudum).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 291, third line from top of page (*Actinometra* sp.); p. 308, pl. 5, figs. 5 *a—d*; pl. 58, figs. 1, 2 (*Actinometra stelligera*).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 21, 1889, p. 312, pl. 21, figs. 6—10 (*Actinometra notata*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N°. 1, p. 104 (*Actinometra stelligera*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra maculata*); p. 399 (*Antedon bassett-smithi*).
KOEHLER. Revue suisse zool., vol. 3, 1895, p. 292 (*Actinometra stelligera*).
CHADWICK. in Herdman, Ceylon Pearl Oyster Reports, vol. 2, 1904, Suppl. Report 11, p. 157 (*Actinometra notata*).
A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 136.
A. H. CLARK. Recent Crinoids of Australia, 1911, p. 738.
A. H. CLARK. Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, pp. 439, 443.
A. H. CLARK. Proc. U. S. National Museum, vol. 43, 1912, p. 386.
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 68.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N°. 10, p. 3.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N°. 15, p. 3.
REICHENSPERGER. Abhandl. der Senck. nat. Ges., vol. 35, 1913, part 1, p. 84.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.
H. L. CLARK. Carnegie Institution of Washington Publication N°. 212, 1915, p. 101.

Stat. 89. Pulu Kaniungan ketjil. 11 Metres. 1 Ex.
Stat. 96. Sulu Archipelago, southeastern side of the Pearl Bank. 15 Metres. 6 Ex.
Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 Metres. 2 Ex.
Stat. 322. Southern coast of Bawean Island, $1^1/_2$ miles south of Tandjong Lajar. 32 Metres. 1 Ex.

The specimen from Stat. 89 is small, with 30 arms.

Of the examples from Stat. 96 the largest has 43 arms 100 mm. long, and the cirri 22 mm. to 26 mm. long with 23—25 segments; the dorsal pole of the centrodorsal is very slightly concave, 3.5 mm. in diameter; another has 43 arms about 85 mm. long, and cirri 20 mm. to 22 mm. long with 24—26 segments of which the eleventh, twelfth or thirteenth is a transition segment; a third is similar to the preceding with 35 arms 95 mm. long and cirri 20 mm. to 23 mm. long; a fourth has 33 arms 95 mm. long and cirri XX, 22—24, 28 mm. to 29 mm. long; the ninth or tenth is a transition segment; a fifth has 29 arms 80 mm long, being on the individual rays 8 (4 + 4), 4 (1 + 3), 7 (4 + 3), 8 (3 + 5), and 2; the anal area of the disk is studded with scattered large rounded-conical concretions; the remaining specimen is young, with 12 arms 40 mm. long.

These examples belong to a variety of the species which possesses more than the typical number of arms, and shows great irregularity in the arm division. It was upon a specimen of this variety that CARPENTER based his name *notata*, though he failed to recognize the true affinities of his supposed new species and described it as closely related to *Comatula* (*Validia*) *rotalaria*.

The larger specimen from Stat. 99 also belongs to the *notata* type; it has 37 arms (on the five rays 6, 6, 9, 7, 9), 95 mm. long; the cirri are XXV, 25—26 (usually 25), 20 mm. to 23 mm. long, moderately slender; the twelfth, thirteenth or fourteenth is a transition segment; the smaller specimen has 31 arms.

The individual from Stat. 322 has 33 arms 170 mm. long and cirri XVIII, 21—23, 25 mm. long; the ninth is a transition segment; the whole animal is large and robust.

3. *Comatella maculata* (P. H. Carpenter).

LÜTKEN. Mus. Godeffroy Cat., vol. 5, 1877, p. 100 (*Actinometra fusca*, nomen nudum).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 307, pl. 5, figs. 1 *a—d*; pl. 55, fig. 2 (*Actinometra maculata*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra simplex*).
BELL. Proc. Zoöl. Soc. London, 1898, p. 849 (*Actinometra* sp.).
BELL. Trans. Linn. Soc. (Zoöl.), series 2, vol. 13, 1909, part 1, p. 20 (*Actinometra multiradiata*).
A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 138.
A. H. CLARK. Bull. du Mus. d'hist. nat. de Paris, 1911, N°. 4, p. 246.
A. H. CLARK. Proc. U. S. National Museum, vol. 40, 1911, p. 16.
A. H. CLARK. Recent Crinoids of Australia, 1911, p. 739.
A. H. CLARK. Notes from the Leyden Museum, vol. 33, 1911, p. 177.
A. H. CLARK. Die Fauna Südwest-Australiens, vol. 3, 1911, pp. 439, 443.
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 70.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N°. 10, p. 4.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, part 1, p. 84.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N°. 15, p. 3.
H. L. CLARK. Carnegie Institution of Washington Publication N°. 212, 1915, p. 101.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.

Stat. 89. Pulu Kaniungan ketjil. 11 Metres. 2 Ex.
Stat. 96. Sulu Archipelago, southeastern side of Pearl bank. 15 Metres. 1 Ex.
Stat. 213. Saleyer, coral reef 1 Ex.

The larger specimen from Stat. 89 has 22 arms 80 mm. long; the smaller, which is undergoing adolescent autotomy, has 21 arms.

The example from Stat. 96 is quite typical; there are 16 arms, and in addition a IIBr series ending in a pair of pinnules; the arms are 65 mm. long; the centrodorsal is thin discoidal, the dorsal pole flat, 3.0 mm. in diameter; the cirri are slender, XXI, 17—18, 9 mm. to 11 mm. long; the seventh or, more rarely the eighth, is a transition segment.

The specimen from Saleyer is typical with 20 arms 90 mm. long.

Palaeocomatella A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 18.

Genotype. — *Actinometra difficilis* P. H. Carpenter, 1888.

Diagnosis. — Post-radial structure as in the species of *Neocomatella*; proximal cirrus segments, except the basal, elongated; outer cirrus segments short and bearing dorsal tubercles as in *Comatella*; centrodorsal large, circular, thin discoidal, the cirrus sockets in one and a partial second marginal row, but the second row, instead of alternating irregularly with the first as in all the other genera of the Comasteridae, is exactly beneath the first so that the cirrus sockets are arranged in columns, five to each radial area.

1. *Palaeocomatella difficilis* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 93, pl. 52, fig. 2 (*Actinometra difficilis*); p. 304 (specimen from Stat. 192), pl. 52, fig. 2 (*Actinometra pulchella*).

Stat. 105. 6° 8′N., 121° 19′ E. 275 Metres. 1 Ex.

The centrodorsal is thin discoidal, circular, the large polar area flat, 3.0 mm. in diameter, with a slightly elevated rim; the cirrus sockets are closely crowded, and are arranged in twenty-five columns of two (more rarely one) each.

The cirri are about XXX, 10—11, 6 mm. long, the distal portion strongly curved; the first segment is very short, the second nearly or quite twice as long as the median diameter and strongly constricted centrally, the third from three to four times as long as the median diameter, a transition segment, slightly constricted centrally with a swollen distal end; the fourth segment is from half again to twice as long as its proximal diameter, expanding evenly from the proximal to the distal end; the next two segments are about as long as the proximal diameter, and the remainder are slightly shorter than the proximal diameter; the fourth has a slight subterminal median dorsal tubercle; this on the next three segments gradually increases in size and moves to a central position; the opposing spine, though slightly larger than the tubercle on the preceding segment, is very small; it is subterminal and sharp; the terminal claw is twice as long as the penultimate segment, long, moderately slender, and moderately and evenly curved. The distal portion of the cirri is moderately compressed.

The ends of the basal rays are visible as minute tubercles in the angles of the calyx. The radials are entirely concealed. The IBr_1 are concealed in the median line, but are partially visible in the angles of the calyx; their lateral edges diverge from those of the adjacent IBr_1 at approximately a right angle; the axillaries are broadly pentagonal, twice as broad as long; the lateral edges are slightly concave, and the anterior angle is sharp; they are widely separated from their neighbours; the IIBr series are 2; the $IIBr_1$ are very short, slightly wedge-shaped, about four times as broad as the greater (outer) length, almost entirely united interiorly; the $IIBr_2$ (axillaries) are broadly pentagonal, twice as broad as long, the lateral edges from one half to two thirds the length of those of the $IIBr_1$. The union of the elements of the IBr series and of the IIBr series is extremely close, and with difficulty distinguishable from a pseudosyzygy.

The 20 arms were probably about 50 mm. long; after the seventh the brachials become triangular, about as long as broad, with the distal edges concave.

The first syzygy is normally between brachials 3 + 4 on the external arms, and 1 + 2 on the internal, but in many cases the first four brachials are grouped in two pairs, the first pseudosyzygial, the second syzygial; the brachials following the basal syzygial pairs as far as the seventh are wedge-shaped, with the anterior edges concave and slightly produced and spinous, twice as broad as the median length.

P_1 is 9 mm. long, very slender, composed of 35 short segments; the comb has 18 teeth of which the distal 10 or 11 are abruptly larger than those preceding, long, lance-shaped, longer than the lateral diameter of the segments which bear them. P_2 is 5.5 mm. long, much

more slender, but otherwise similar. P_3 is similar to P_2, but slightly smaller and shorter. P_4 is 3.5 mm. long with 17 segments of which the distal bear traces of a comb. P_5 is very small and slender, 3 mm. long, with no trace of a comb.

In the "Challenger" report Dr. P. H. CARPENTER records (p. 304) under the name of *Actinometra pulchella* a somewhat anomalous specimen which was dredged near the Kei Islands (5° 49′ 15″ S., 132° 14′ 15″ E.) in 140 fathoms. *Actinometra pulchella* (now known as *Neocomatella alata*) is confined to the Caribbean region, and belongs to a genus, *Neocomatella*, which is exclusively Atlantic, its representative in the Indo-Pacific region being the allied *Comatella*.

This specimen gave Carpenter considerable trouble; at first he had believed that it represented a new species, and on p. 93 of the "Challenger" report he mentions it under the name of *Actinometra difficilis*, saying of it that "the two outer radials [i. e., the two elements of the IBr series], the two distichals [i. e., the two elements of the IIBr series] and the first two brachials are respectively united by syzygy." He refers to fig. 2 on pl. 52 as representing this specimen.

The figure shows a much broken individual with about 18 arms; the dorsal pole of the centrodorsal is circular, broad and flat, 4.0 mm. in diameter; there were apparently about XX cirri which are 13 mm. long with 16 segments of which the longest are over twice as long as broad, and the last eight are broader than long; the brachials beyond the basal appear to be triangular, about as long as broad, judging from the regenerating arm in the upper right hand side of the figure.

It is evident that CARPENTER's specimen is very close to that just described, differing chiefly in the larger size, and in certain features such as an increased number of cirrus segments and a relatively lesser length of the longer proximal cirrus segments, which are usually correlated with increased size. The apparent difference in the number of the cirrus sockets may or may not be real, on account of the indistinctness of the drawing. It seems reasonable, therefore to refer the "Siboga" specimen to the same species for which the name *difficilis* is available.

With the arm structure of the Atlantic type (*Neocomatella*) this species possesses a very anomalous centrodorsal which is circular, and has the second row of cirrus sockets below the first instead of alternating with it as in all of the other genera of the *Comasteridae*.

It appears most logical, therefore, to erect for the reception of this species a new genus, *Palaeocomatella*, most nearly related to the Atlantic *Neocomatella*, but differing markedly in its curious centrodorsal. Whether this disposition is the correct one must be left for future investigation to determine.

Capillaster A. H. Clark.

Key to the Species of the Genus Capillaster.

a[1] Cirri absent; centrodorsal reduced to a small stellate plate lying within the radial circlet (Borneo and the China Sea) . . . . . *macrobrachius*

a² Cirri present.
  b¹ 26—40 cirrus segments; 40—110 (usually over 60) arms.
    c¹ distal cirrus segments about as long as broad (Java Sea) . . . . *gracilicirra*
    c² distal cirrus segments much broader than long (Maldive Islands to western Australia and the Sunda Islands, the Moluccas, the Philippine Islands and Singapore) . . . . . *sentosa*
  b² not more than 26 cirrus segments; not more than 35 (usually 15—25) arms.
    c¹ outer cirrus segments slightly longer than broad (Java Sea) . . . *tenuicirra*
    c² outer cirrus segments broader than long.
      d¹ cirri short and stout, composed of 20—21 segments all of which are broader than long (Aru Islands). . . . . *clarki*
      d² cirri longer and less stout, one or more of the proximal segments being longer than broad.
        e¹ size large (arm length 160 mm.); division series perfectly smooth; 27—30 cirrus segments; entire animal mottled with whitish; disk without calcareous concretions (southwestern Japan) . *mariae*
        e² size medium (arm length very rarely over 125 mm., and never so much as 150 mm.); ossicles of the division series usually with finely spinous distal edges, so that the division series appear rough; no whitish mottling; disk usually with calcareous nodules more or less developed.
          f¹ larger, stouter and more robust; usually 15—25 arms; IIIBr series often present; usually more than 23 cirrus segments (Ceylon to western and northern Australia, and northward throughout the Malay Archipelago to the Caroline Islands, the Philippines and Formosa) . . . . . *multiradiata*
          f² small, slender and weak, with 12—19 arms IIIBr series never present; 21—23 cirrus segments (Madagascar) . . . . *coccodistoma*

1. *Capillaster macrobrachius* (Hartlaub).

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforscher, vol. 58, 1891, N°. 1, p. 101 (*Actinometra macrobrachius*).
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 73.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N°. 10, p. 4.

Stat. 77. 3° 27′ S., 117° 36′ E. (Borneo Bank). 59 Metres. 1 Ex.

This specimen, which is much smaller than the type, has about 25 arms which are about 70 mm. long; three of the IIBr series are 2, the other three being 4 (3 + 4); the IIIBr series are all 3 (2 + 3) except one following a IIBr 2 series, which is 4 (3 + 4). The centrodorsal, though stellate, has not as yet quite sunk to the level of the radials; it bears a few

small pits, the remnants of cirrus sockets, on its margin. The colour is yellowish white, the pinnules being yellow green.

Except for the smaller size and the slightly less developed centrodorsal this specimen agrees well with the type, with which it was directly compared.

2. *Capillaster gracilicirra* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 18.

Stat. 318. 6° 36'.5 S., 114° 55'.5 E. 88 Metres. 3 Ex.
Stat. 320. 6° 5' S., 114° 7' E. 82 Metres. 1 Ex.

One of the specimens from Stat. 318 is a magnificent example of the species; it has 110 arms 140 mm. long; no fully developed cirri are preserved, but from the young cirri present it appears undoubtedly to be referable to this form instead of to *C. sentosa* which, except for the cirri, it exactly resembles. The other two are smaller, with 33 and 35 arms and cirri 35 mm. long composed of 28—36 segments. They seem to belong to *C. gracilicirra* rather than to *C. tenuicirra*, though they have not as yet acquired all of the characters of that type.

The single individual from Stat. 320 has been chosen as the type of the species; the cirri are XVII, 27—35 (usually nearer the latter), 33 mm. long; the longest proximal cirrus segments are twice as long as broad, slightly constricted centrally with swollen ends; the shorter distal segments are about as long as broad; the tenth or eleventh is a transition segment; the eleventh or twelfth has several sharp spines on the distal dorsal border; in the following two or three segments the central spine rapidly increases in size, becoming a long subterminal dorsal spine, flanked at the base by a smaller one on either side. The other characters are as in *C. sentosa*. There are 51 arms 100 mm. long.

The smaller specimens from Stat. 318 are peculiar in having on the outer cirrus segments two dorsal spines, a proximal and a distal.

3. *Capillaster sentosa* (P. H. Carpenter).

Lamarck. Hist. nat. des animaux sans vertèbres, vol. 2, 1816, p. 533 (*Comatula multiradiata*, part).
J. Müller. Abhandl. d. k. preuss. Akad. d. Wiss., Berlin, 1847 (1849), p. 261 (*Comatula* [*Alecto*] *multiradiata*, part).
P. H. Carpenter. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 521 (*Actinometra multiradiata*, part).
P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 325, pl. 66, figs. 4—6 (*Actinometra sentosa*).
Koehler. Mem. soc. zool. France, vol. 8, 1895, p. 421 (*Actinometra sentosa*).
Bell. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, part 3, p. 225 (*Actinometra sentosa*).
A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 201 (*Comaster sentosa*).
A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 391 (*Comaster sentosa*).
A. H. Clark. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 133
A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 530.

A. H. CLARK. Bull. du Mus. d'hist. nat. de Paris, 1911, N°. 4, p. 246.
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 73.
A. H. CLARK. Records of the Indian Museum, vol. 7, 1912, part 3, N°. 26, p. 267.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N°. 10, p. 4.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N°. 15, p. 4.
A. H. CLARK. Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 116.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.

Stat. 79. 2° 43′ S., 117° 44′ E. (Borneo Bank). 41—54 Metres. 1 Ex.
Stat. 240. Banda. 9—36 Metres. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 Metres. 1 Ex.

The specimen from Stat. 79 has about 80 arms 130 mm. long; the cirri are 35 mm. long with 37—38 segments.

The example from Stat. 299 has 56 arms 110 mm. long; the cirri are 25 mm. to 30 mm. long with 29—30 segments.

The individual from Banda is small with 17 arms, and is undergoing adolescent autotomy; the left posterior and left anterior rays are in process of multiple division; the former has one IIBr 4 (3 + 4) series which bears internally a IIIBr 3 (2 + 3) series carrying two IVBr 3 (2 + 3) series; the latter has one IIBr 4 (3 + 4) series which bears a IIIBr 3 (2 + 3) series externally, and a IIIBr 4 (3 + 4) series internally, the former carrying on the left (innermost) side a IVBr 3 (2 + 3) series. This is the first record in the genus of a 4 (3 + 4) series replacing a normal 3 (2 + 3) series. The specimen is slender and delicate.

4. *Capillaster tenuicirra* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 18.

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. 118 Metres. 2 Ex.
Stat. 318. 6° 36′.5 S., 114° 55′.5 E. 88 Metres. 14 Ex.
Stat. 319. 6° 16′.5 S., 114° 37′ E. 82 Metres. 1 Ex.
Stat. 320. 6° 5′ S., 114° 7′ E. 82 Metres. 16 Ex.

A specimen from Stat. 166 may be described as follows.

The centrodorsal is thick discoidal, rather small, the bare polar area flat, 3 mm. in diameter; the cirrus sockets are arranged in a single irregular marginal row.

The cirri are XII, 24—27, 25 mm. long; the first segment is very short, the second and third about twice as broad as the ventral length, the fourth half again as long as broad, the fifth twice as long as broad, the sixth resembling the fifth, the following gradually decreasing in length so that the tenth or eleventh and those following are very slightly longer than broad; the sixth is a transition segment; the cirri taper slightly from the base to the middle of the transition segment, from that point onward being more slender and highly polished; from the transition segment onward the segments have the distal dorsal edge slightly everted, forming a low and inconspicuous transverse ridge just within the distal dorsal border which is narrowly crescentic in end view, never becoming pointed; this is so low as to be almost imperceptible in lateral view, so that the cirri superficially appear quite smooth; the opposing

spine is very small, terminal; the terminal claw is slightly longer than the penultimate segment, moderately slender, and moderately and evenly curved.

The ends of the basal rays are just visible in the angles of the calyx, bridging over the narrow subradial clefts; the IBr_1 are very narrow, trapezoidal, about five times as broad as long, entirely united laterally; the IBr_2 (axillaries) are very broadly pentagonal, twice as broad as long, free laterally; the IIBr series are 4 (3 + 4).

There are 20 arms 110 mm. long; one of the IIBr series is absent, but a IIBr 2 series (the only IIBr series not 4 [3 + 4]) bears a IIIBr 2 series internally; the brachials resemble those in young specimens of *C. multiradiata*; the more proximal are obliquely wedge-shaped, almost triangular, half again to twice as broad as long; the distal edges of the brachials are slightly produced, and are armed with numerous short fine spines. Syzygies occur between brachials 2 + 3, 13 + 14 to 30 + 31 (usually in the vicinity of the 15th), and distally at intervals of from four to eight (usually seven) oblique muscular articulations. The dorsal and lateral surfaces of the arms and division series are thickly beset with very fine spines, which are rather more prominent on the lateral surfaces.

P_D is 15 mm. long with 30 segments; the comb, which resembles that of *C. multiradiata*, consists of from seven to nine well developed, and three or four rudimentary teeth; the pinnule is comparatively slender; P_1 is 14 mm. long, similar to P_D, but slightly more slender; P_2 is 13 mm. long, similar to P_1; P_3 is 10 mm. long, resembling the preceding; P_4 is 8 mm. long, with a comb; combs occur at intervals to the end of the proximal half of the arm.

The mouth is submarginal, radial; the anal tube is central; the perisome of the disk is naked.

Another specimen from Stat. 166 has 14 arms 100 mm. long and cirri XVI, 28—30, 28 mm. long; on some of the cirri the outermost segments bear dorsally a transverse ridge with a small but distinct spine in the centre; one of the IIBr series is 2, the remainder 4 (3 + 4).

Of the fourteen specimens from Stat. 318 one has 10 arms, two have 11, three 12, one 13, one 15, three 16, one 23, one 25, and one 30; the largest and best developed example has 25 arms 125 mm. long, and cirri 35 mm. to 40 mm. long; the arms borne by the five rays are 4, 4, 3, 3, 11; the right posterior ray bears a IBr series ending in a trapezoidal ossicle from which four arms are given off, two, side by side, from its distal (longest) face, and one from each of the lateral faces; this segment represents two normal IIBr axillaries (with their derivatives) fused, and there is a faintly indicated median dividing line. Another large individual has 23 arms 125 mm. long; of the nine IIBr series one is 2, one 1, and the others 4 (3 + 4); individual IIIBr series are all internal.

The specimen from Stat. 319 has 32 arms 85 mm. long; on every ray one of the derivatives from the IBr axillary remains undivided so that 27 of the arms are borne upon five IIBr series.

Of the examples from Stat. 320 two have 10 arms, two 12, two 13, two 14, one 17, one 18, two 21, two 22, one 23, and one 28; one with 21 arms has the anterior and right

anterior rays only about half the size of the others, with 4 and 5 arms; there are three IIIBr series, all internal; the arms are robust; the other with 21 arms has the arms distributed on the various rays as follows: 2, 5 (4 + 1); 5 (1 + 4), 4 (1 + 3), 5 (4 + 1); one of the IIBr series is 3 (2 + 3), the other three being 4 (3 + 4); all the IIIBr series are 3 (2 + 3); only a single cirrus is present, the centrodorsal approaching the condition of a sunken stellate plate; one with 22 arms 130 mm. long has one IBr series bearing two undivided arms, and three others with one divided and one undivided derivative; there are four internally developed IIIBr series, and two IIIBr series on a single IIBr series; the only external IIIBr series is 2 instead of, as the others, 3 (2 + 3); the other with 22 arms has the two posterior rays and their derivatives less than half the size of the others; there are three IIIBr series, all internal, and all 3 (2 + 3); the specimen with 23 arms has the right anterior arm very small, and the anterior arm of about the same size; the left anterior arm is slightly larger, and the other two arms are normal; all the small rays have four arms each, the right anterior and the anterior with two IIBr 2 series, and the left anterior with two IIBr 4 (3 + 4) series; the IIIBr series are internal; the example with 18 arms has four of the IIBr series 2, and four 4 (3 + 4); that with 17 arms has one ray with only IBr series, and on another ray an undivided arm springing from a IBr axillary; one of the specimens with 13 arms has on one ray two IIBr 2 series one of which bears externally a IIIBr 3 (2 + 3) series; the other has one IIIBr series; one of those with 14 arms has three IIIBr series, two on a single IIBr series, the other externally developed; one of the 12 armed individuals has one of the IIBr series 2, the other 4 (3 + 4); one of the 10 armed examples is of mature size.

The specimen from Stat. 322 is large, with 16 arms 125 mm. long; the cirri are rather small and slender, XVI, 21, 15 mm. to 17 mm. long.

Extraordinary variability appears to be characteristic of this form; the arms vary from 10 to 30 in number; the cirri are usually very slender with the distal segments longer than broad and bearing single dorsal spines, but they may be stouter with the distal segments not longer than broad, in which case they bear two dorsal spines, a distal and a proximal.

5. *Capillaster multiradiata* (Linné).

PETIVER. Gazophylacium, 1716, pl. 4, fig. 6 (*Stella Chinensis perlegens*).
LINCK. De Stellis Marinis, 1733, p. 53 (Τρισκαιδεκάκνεμος).
SCHULZE. Betrachtung der versteinerten Seesterne, 1760, p. 17 (*Triscaedecacnemos*).
LINNÉ. Syst. Nat., ed. 10, 1758, vol. 2, p. 663 (*Asterias pectinata*, reference to Petiver; *Asterias multiradiata*, type specimen at Lund, upon which the description is based, but none of the references cited).
A. J. RETZIUS. K. Svensk. Vetensk. Akad. Handl., vol. 4, År 1783, p. 241 (*Asterias multiradiata*).
LATHAM and DAVIS. Faunula Indica, 1795, p. 32 (*Asterias multiradiata*).
A. J. RETZIUS. Dissertatio sistens species cognitas asteriarum, 1805, p. 35 (*Asterias multiradiata*).
LAMARCK. Hist. nat. des animaux sans vertèbres, vol. 2, 1816, p. 534 (*Comatula fimbriata*.
J. MÜLLER. Abhandl. d. k. preuss. Akad. d. Wiss., 1841 (1843), p. 218 (*Asterias multiradiata*); pp. 184, 224 (*Comatula fimbriata*).
J. MÜLLER. Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 258 (*Comatula* [*Alecto fimbriata*); p. 261 (*Comatula* [*Alecto*] *multiradiata*).

LÜTKEN. Vidensk. Medd. fra den naturhist. Forening i Kjøbenhavn, 1871, p. 273 (*Antedon fimbriatus*).
LÜTKEN. Cat. Mus. Godeffroy, vol. 5, 1874, p. 190 (*Actinometra gracilis*, nomen nudum).
GRUBE. Jahresber. der Schles. Ges. für vaterland. Cultur, vol. 53, 1875, p. 75 (*Comatula* [*Actinometra*] *borneensis*).
VON GRAFF. Das Genus *Myzostoma*, 1877, pp. 19, 20, 24 (*Comatula fimbriata*).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 15, 1880, p. 188 (*Actinometra multiradiata*).
BELL. Proc. Zoöl. Soc. London, 1882, p. 535 (*Actinometra coppingeri*, nomen nudum).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 521 (*Actinometra multiradiata*, part).
BELL. "Alert" Report, 1884, p. 168, pl. 16, fig. B (*Actinometra coppingeri*).
P. H. CARPENTER. "Challenger" Reports. The Stalked Crinoids, 1884, pp. 44, 52, 337 (*Actinometra multiradiata*).
VON GRAFF. "Challenger" Reports. Myzostoma, 1884, pp. 16, 19 (*Actinometra fimbriata*); p. 57 (*Comatula fimbriata*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, pp. 58, 317, 321, 366 (*Actinometra borneensis*); p. 317, pl. 62, figs. 2—4 (*Actinometra fimbriata*); p. 320, pl. 60, figs. 1, 2 (*Actinometra coppingeri*); p. 321 (*Actinometra stewarti*); p. 322, pl. 66, figs. 1—3 (*Actinometra multiradiata*).
STUDER. Die Forschungsreise S. M. S. "Gazelle" in den Jahren 1874—6, III Theil, 1889, Zool. und Geol., pp. 194, 195 (*Actinometra multiradiata*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N°. 1, p. 101 (*Actinometra coppingeri*); p. 102 (*Actinometra fimbriata*); p. 103 (*Actinometra multiradiata*).
NORMAN. Ann. and Mag. Nat. Hist., series 6, vol. 7, 1891, p. 386 (*Asterias multiradiata*).
BATHER. Ann. and Mag. Nat. Hist., series 6, vol. 7, 1891, p. 464 (*Asterias multiradiata*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 394 (*Actinometra multiradiata*); p. 396 (*Actinometra fimbriata*).
KOEHLER. Mem. soc. zool. France, vol. 8, 1895, p. 421 (*Actinometra multiradiata*).
LUDWIG. Abhandl. der Senck. nat. Ges., vol. 21, 1899, part 4, p. 539 (*Actinometra fimbriata*).
THOMPSON. Proc. Roy. Soc. Edinburgh, vol. 22, 1899, p. 322 (*Actinometra multiradiata*).
PFEFFER. Abhandl. der Senck. nat. Ges., vol. 25, 1900, p. 85 (*Actinometra fimbriata*; *Act. coppingeri*).
BELL. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, part 3, p. 225 (*Actinometra multiradiata*; *Act. fimbriata*).
CHADWICK. in Herdman, Ceylon Pearl Oyster Report, vol. 2, Suppl. Rep. 11, p. 157 (*Actinometra multiradiata*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 201 (*Comaster fimbriata*); p. 202 (*Comaster coppingeri*).
A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, p. 391 (*Comaster multiradiata*).
A. H. CLARK. Zool. Anzeiger, vol. 34, 1909, p. 364.
A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 134.
A. H. CLARK. Bull. du Mus. d'hist. nat. de Paris, 1911, N°. 4, p. 246.
A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 530.
A. H. CLARK. Notes from the Leyden Museum, vol. 33, 1911, p. 177.
A. H. CLARK. Recent Crinoids of Australia, 1911, p. 736.
A. H. CLARK. Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, pp. 437, 439, 443, 444, 445.
A. H. CLARK. Crinoids of the Indian Ocean, 1912, pp. 74, 310.
A. H. CLARK. Proc. U. S. National Museum, vol. 43, 1912, p. 386.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N°. 10, p. 4.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, part 1, p. 84; p. 85 (*Capillaster clarki*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N°. 15, p. 5.

A. H. CLARK. Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 117.
H. L. CLARK. Carnegie Institution of Washington Publication N°. 212, 1915, p. 101.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.

Stat. 33. Bay of Pidjot, Lombok. 22 Metres and less. 1 Ex.
Stat. 37. Sailus ketjil, Paternoster Islands. 27 Metres and less. 1 Ex.
Stat. 40. Anchorage off Pulu Kawassang, Paternoster Islands. Coral Reef. 1 Ex.
Stat. 47. Bay of Bima, near south fort. 55 Metres. 1 Ex.
Stat. 49ª. 8° 23′.5 S., 119° 4′.6 E. (Sapeh Strait). 69 Metres. 5 Ex.
Stat. 50. Bay of Badjo, western coast of Flores. Up to 40 Metres. 3 Ex.
Stat. 60. Haingsisi, Samau Island. Reef. 1 Ex.
Stat. 90. 1° 17′.5 N., 118° 53′ E. 281 Metres. 2 Ex.
Stat. 93. Pulu Sanguisiapo, Tawi Tawi Islands, Sulu Archipelago. 12 Metres. 1 Ex.
Stat. 99. 6° 7′.5 N., 120° 26′ E. (Anchorage off North Ubian). 16—23 Metres. 10 Ex.
Stat. 133. Anchorage off Lirung, Salibabu Island. Up to 36 Metres. 4 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 2 Ex.
Stat. 162. Western Coast of Salawatti, between Loslos and Broken Islands. 18 Metres. 2 Ex.
Stat. 240. Banda. 9—36 Metres. 2 Ex.
Stat. 250. Anchorage off Kilsuin, western coast of Kur Island. 20—45 Metres. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands. 13 Metres. 8 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 Metres. 1 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. (Anchorage between Nusa Besi and the northeastern point of Timor). 27—54 Metres. 1 Ex.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. (Anchorage on the southern coast of Timor). 34 Metres. 1 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 Metres. 4 Ex.
Stat. 296. Anchorage off Noimini, southern coast Timor. Coral Reef. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. (Buka or Cyrus Bay, southern coast of Rotti Island). 34 Metres. 1 Ex.

The specimen from Stat. 33 has 20 arms 100 mm. long; all the IIBr series are developed.

The example from Stat. 37 has 19 arms; three of the eight IIBr series are 2; one of these bears externally a IIIBr 2 series. On all the arms the first syzygy is between brachials 2 + 3.

The specimen from Stat. 40 has 11 arms 90 mm. long.

The individual from Stat. 47 has 20 arms 125 mm. long; the cirri are 22 mm. or 23 mm. long; the brachials are very short, discoidal, their distal edges strongly everted and abundantly supplied with short spines so that the animal feels very dry or rough; three of the IIBr series are 2 and one, paired with one of 2, is 1; the others are 4 (3 + 4).

Of the five examples from Stat. 49ª the largest has 30 arms 100 mm. long; all of the internal IIIBr series are present, and all are 3 (2 + 3); the longest cirrus segments are not more than one third again as long as broad; the colour is deep violet, contrasting with the colour of the others, which are yellow brown, the smaller the lighter. Another example from this station has 19 arms 90 mm. long; two of the IIBr series are lacking; there is one IIIBr series of 3 (2 + 3), externally developed. Of the other three individuals one has 13 arms 40 mm. long, and the others 11 arms 55 mm. and 50 mm. long.

The three from Stat. 50 are of medium size; two have 18 arms; in one of these there is a IIBr 2 series; the third has 14 arms 80 mm. long.

One of the specimens from Stat. 90 has 18 arms 105 mm. long; there are no IIIBr

series; the colour is nearly black; the other has 14 arms 105 mm. long; there are no IIIBr series; the colour is light brownish gray with a narrow band of very dark brown across every articulation.

The example from Stat. 93 has 11 arms 50 mm. long; the single IIBr series is just forming through adolescent autotomy.

The details of the 10 specimens from Stat. 99 are as follows: (1) 26 arms 95 mm. long; all of the IIBr series are present, and all are 4 (3 + 4); the six IIIBr series, all internally developed, are all 3 (2 + 3); (2) 20 arms 90 mm. long; all the IIBr series are present, one 2, nine 4 (3 + 4); (3) 20 arms 70 mm. long; all the IIBr series are present, all 4 (3 + 4); (4) 20 arms 70 mm. long; all the IIBr series are present; (5) 20 arms 80 mm. long; all the IIBr series are present; (6) 12 arms 60 mm. long; the two additional arms are just appearing through adolescent autotomy; (7) 14 arms; (8) 14 arms; (9) 12 arms; (10) 10 arms.

The largest specimen from Stat. 133 has 15 arms 85 mm. long; one of the IIBr series is 3 (2 + 3), the other four being 4 (3 + 4); another has 19 arms 70 mm. long; two of the IIBr series are 2, one of these bearing internally a IIIBr 2 series; a third has 15 arms, there being one IIBr series on each ray; the IIBr series are all 4 (3 + 4); the fourth specimen, which is small, has 11 arms.

One of the examples from Stat. 144 has 18 arms, there being no IIBr series on one ray; the other has 17 arms 95 mm. long, and is evidently young.

The individuals from Stat. 162 are small; one has 14 arms with all the IIBr series 4 (3 + 4); the other has 13 arms with one of the IIBr series 2 and two 4 (3 + 4).

The individual from Stat. 250 has 14 arms 50 mm. long and cirri XIII, 14 mm. long.

The details of the eight specimens from Stat. 273 are as follows: (1) 25 arms 50 mm. long; of the five IIIBr series four are on two of the IIBr series, and the fifth is externally developed; the cirri are XVI, 23, 13 mm. to 15 mm. long; the longest cirrus segments are not over one third again as long as broad; (2) 18 arms 65 mm. long; there are no IIIBr series; the brachials are short triangular; (3) 16 arms 60 mm. long; the brachials are short triangular; the cirri are XX, 16—18, 10 mm. long; the longest cirrus segments are not more than one third longer than broad; (4) 15 arms 80 mm. long; the brachials are short triangular; the cirri are XXIV, 17—21, 13 mm. long; the longest cirrus segments are about one third again as long as broad; (5) 15 arms 65 mm. long; the brachials are short triangular; there is one IIIBr series, 3 (2 + 3), internally developed; the cirri are XX, 16—19, 10 mm. long; the longest cirrus segments are not more than one third again as long as broad; (6) 15 arms 65 mm. long; the brachials are more nearly discoidal than in the preceding; the cirri are XXII, 19, 12 mm. long; the longest cirrus segments are less than one third again as long as broad; (7) 14 arms 55 mm. long; the brachials are short triangular; the cirri are XXIV, 15—16, 10 mm. long; the longest cirrus segments are half again as long as broad; (8) 14 arms, small, undergoing adolescent autotomy; the longest cirrus segments are twice as long as broad; the disk bears about twenty-four large conical calcareous tubercles irregularly scattered over the anal area, and many small calcareous nodules on and at the base of the anal tube.

The specimen from Stat. 274 has 20 arms 110 mm. long; there are four IIIBr series present, three internal and one external, paired with one of the internal; the cirri are XVII, 23—25, 20 mm. long; the longest cirrus segments are about a third again as long as broad.

The example from Stat. 282 has 20 arms.

The individual from Stat. 285 is very small with 10 arms.

Of the four from Stat. 294 the largest has 14 arms 35 mm. long; all of the IIBr series are 4 (3 + 4); another has 11 arms 35 mm. long; the single IIBr series is 4 (3 + 4); the other two have 10 arms.

The specimen from Stat. 299 has 19 arms 80 mm. long; there are no IIIBr series; the cirri are XVII, 18—20, 15 mm. long.

Of the two from Banda the larger has about 26 arms about 105 mm. long; three of the IIBr series are 2; the IIIBr series are 3 (2 + 3); the cirri are XV, 24—26, 22 mm. to 25 mm. long.

The very fine example from the reef at Haingsisi has 20 arms 140 mm. long; all of the IIBr series are present, and all are 4 (3 + 4); the cirri are XIII, 20—21, 15 mm. long; the longest cirrus segments are not more than one third again as long as broad; the animal is very robust; the brachials are very short with strongly produced distal edges.

From the coral reef at Noimini (Stat. 296) there is a small specimen with 15 arms; one of the IIBr series is 2.

Dr. REICHENSPERGER has recently described, under the name of *Capillaster clarki*, a new species of this genus from the Aru Islands based upon two specimens dredged by Dr. MERTON near Pulu Bambu in 10 metres; the cirri of the supposed new form are XXVIII—XXXIV, 20—21, 15 mm. long, stout, the longest segments (fifth-seventh) slightly longer than broad; the arms are 27—35, 85 mm. to 100 mm. long.

The essential character of *Capillaster clarki* is the shortness of the proximal cirrus segments. The numerous specimens from the Aru Islands in the "Siboga" collection are for the most part characterized by rather unusually short cirrus segments, but as a similar shortening of the longer proximal cirrus segments is not infrequent in examples of the species from other localities I do not believe that *C. clarki* can be maintained as a separate form.

The smaller of Dr. REICHENSPERGER's two specimens has highly irregular division series, as in the type of *C. mariae*. But this same extraordinary irregularity is occasionally found in undoubted specimens of *C. multiradiata*, and, rather more commonly, in the large species of the allied genus *Nemaster* which represents *Capillaster* in the Atlantic.

The ten armed young of this species may be distinguished from those of the species of *Comaster* or of *Comanthus* by the long and slender cirri with a slight distal taper which, as commonly found, are nearly or quite straight. The cirri of the young of the species of *Comaster* and *Comanthus* are shorter with fewer segments, and the distal half is always strongly recurved.

Comissia A. H. Clark.

Key to the Species of the Genus Comissia.

a^1 25—30 cirrus segments; dorsal surface and distal edge of the pinnule segments very spinous; arms 100 mm. to 120 mm. long; cirri 15 mm. to 20 mm. long (Philippine Islands and Macclesfield Bank) . . . . . *peregrina*[1])

a^2 Not more than 25 cirrus segments

b^1 16—25 (usually 18—25) cirrus segments of which the longest are from half again to twice as long as broad; arms 70 mm. to 100 mm. long; cirri 15 mm. to 17 mm. long; pinnule segments not so spinous as in the preceding (Philippines to the Lesser Sunda and Kei Islands). . *lütkeni*

b^2 not more than 16 cirrus segments

c^1 14—16 cirrus segments

d^1 longest cirrus segments from three to four times as long as broad; cirri XVII, 14—15, 10 mm. long, arranged in two irregular rows on the centrodorsal; ossicles of the division series with slightly prominent and finely spinous distal ends; brachials with strongly overlapping and very spinous distal edges; arms 55 mm. long (Philippines) *horridus*[2])

d^2 longest cirrus segment not more than twice as long as broad

e^1 cirri arranged in three closely crowded marginal rows; P_1 with a comb of about 25 exceptionally long teeth; P_4 with a comb of 15 or 16 teeth; arms about 90 mm. long; cirri 14 mm. long (Christmas Island) . . . . . *pectinifer*

e^2 cirri in a single marginal row; P_1 with a comb of 9—11 teeth; P_3 and the following pinnules without combs; arms about 60 mm. long; cirri 10 mm. to 11 mm. long (Moluccas) . . . . . *littoralis*

c^2 not more than 14 cirrus segments

d^1 arms about 60 mm. long; cirri arranged in a single marginal row

e^1 12—14 cirrus segments of which the longest is from two to two and one half times as long as the proximal diameter (Ceylon) *chadwicki*

e^2 9—10 cirrus segments of which the longest is about four times as long as the proximal diameter (Kei and Philippine Islands) . . . . . *hispida*

d^2 arms not more than 45 mm. long

e^1 more than XX (XX—XXX) cirri, which are from 7 mm. to 9 mm. long; arms 45 mm. long

f^1 ossicles of the division series, brachials and pinnulars with strongly produced distal edges, which are armed with prominent

1) Synonym *Comissia dumetum* A. H. Clark.

2) *Comaster horridus* A. H. Clark, Proc. U. S. National Museum, vol. 39, 1911. p. 533.

spines (Lesser Sunda Islands). . . . . *spinosissima*

f² edges of the ossicles of the division series smooth, and not produced; edges of the brachials and pinnulars not unusually spinous (Philippine to the Lesser Sunda Islands). . *parvula*

e² less than XX cirri, which are 4 mm. to 6 mm. long; arms 30 mm. to 40 mm. long

f¹ XV—XX cirri; distal cirrus segments elongate, the antepenultimate being half again as long as broad and the penultimate about as long as broad (Kei Islands) . . . . . *gracilipes*

f² VIII—XV cirri; antepenultimate segment only slightly, when at all, longer than broad

g¹ cirri VIII—XIV (usually about X), 10—13 (usually 12—13); fourth (longest) cirrus segment from three and one half to four times as long as the median diameter (Red Sea). . *hartmeyeri*

g² cirri XII—XV, 9—11 (usually 10—11); fourth (longest) cirrus segment about three times as long as the median diameter (Amirante and Seychelles Islands, off southeastern Africa) . . . . . *ignota*

1. *Comissia lütkeni* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 502.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 Metres. 1 Ex.
Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 2 Ex.

The specimen from Stat. 260 has the arms about 100 mm. long and the cirri XIV, 23—25, about 15 mm. long.

The larger example from Stat. 305 has the arms about 100 mm. long and the cirri XIX, 21—25 (usually 22—23), 17 mm. long; the fourth is a transition segment; the distal intersyzygial interval is three oblique muscular articulations. The other specimen is similar, but slightly smaller; the single complete cirrus has 20 segments of which the fourth is a transition segment.

All three of these specimens are considerably larger than the two from which the species was originally described, though otherwise resembling them.

2. *Comissia hispida* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 531.

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 Metres. 1 Ex.

The arms of this specimen are about 60 mm. long; the cirri are XIII, 10—11 (usually 10), 8 mm. long; the dorsal pole of the centrodorsal is 2.5 mm. in diameter. The longest

cirrus segments are very slightly less elongate than in the type specimen, but I can find no other differences.

3. *Comissia littoralis* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 18.

Stat. 129. Anchorage off Kawio and Kamboling Islands, Karkaralong group. Reef. 2 Ex.

The centrodorsal is very thin, discoidal, the broad dorsal pole flat, 2.5 mm. to 3.0 mm. in diameter; the cirrus sockets are arranged in a single crowded and more or less irregular marginal row.

The cirri are XXI—XXII, 16, 10 mm. to 11 mm. long; the first segment is short, the second about twice as broad as long, the third about half again as long as the proximal diameter, the fourth about twice as long as the proximal diameter or slightly longer, the fifth about as long as the fourth or slightly shorter; the following rapidly decrease in length, becoming after the eighth or ninth slightly broader than long; the fifth and following have a slight subterminal dorsal tubercle which gradually moves anteriorly, becoming median after the ninth; the opposing spine is very small, subterminal. The earlier longer segments are slightly constricted centrally with prominent ends; the distal shorter segments are laterally compressed and therefore appear broad.

The ends of the basal rays are visible as small tubercles in the angles of the calyx; very narrow subradial clefts are present; the radials are concealed; the IBr_1 are concealed except in the angles of the calyx where their lateral edges diverge at an angle of 90°; the axillaries are almost triangular, twice as broad as long; the lateral edges are very short, making an obtuse angle with those of the IBr_1. The division series and arm bases, which are quite without synarthrial or articular tubercles, extend outward at right angles to the dorsoventral axis; this, with the broad flat centrodorsal carrying a single row of cirri, gives the animal a singularly flattened habitus in contrast to *peregrina* and *lütkeni* in which the division series and arm bases make a slight angle with the plane perpendicular to the dorsoventral axis. In this respect *C. hispida* is intermediate between *littoralis*, and *peregrina* and *lütkeni*.

The ten arms are about 60 mm. long, and slender.

P_1 is considerably longer and stouter than the succeeding pinnules, and bears a comb with 9—11 teeth; P_3 and the following pinnules are without combs.

Seven pentacrinoid larvae were attached to the cirri of these two specimens.

4. *Comissia spinosissima* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 20.

Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 2 Ex.

The centrodorsal is large, thin discoidal, the dorsal pole flat, regularly pentagonal, 2 mm. in diameter.

The cirri are XXX, 10—11, 8 mm. long, small and slender, with the distal edges of

the short outer segments rather strongly produced; the first segment is very short, the second twice as long as the expanded ends, the third the longest, about four times as long as the median diameter; the fourth is nearly as long as the third, but the distal end is more expanded; the fifth is twice as long as its expanded distal end; the following gradually decrease in length so that the antepenultimate is about as long as broad; the second and third segments have both the proximal and distal ends considerably enlarged, and are slender and broadly oval in cross section; the fourth has the proximal end only very slightly enlarged, but gradually expands from the middle to the distal edge, which is produced and overlaps the base of the succeeding segment; the following segments gradually increase in lateral diameter, the enlargement of the distal ends gradually decreasing in extent; the fifth and following segments have slight subterminal tubercles; the opposing spine is terminal, minute, but larger than the tubercle on the preceding segment; the terminal claw is nearly twice as long as the penultimate segment, and is strongly curved.

The radials are concealed in the median line, but are slightly visible in the angles of the calyx; the IBr_1 are very short, oblong, five or six times as broad as long, very closely united with the succeeding axillary, which is triangular, twice as broad as long.

The ten arms are 45 mm. long; the brachials resemble those of *C. hispida*. The ossicles of the division series and the brachials have their distal borders armed with very long fine spines; the segments of the pinnules are exceedingly spinous and the third has a slight, very spinous, carination.

The second specimen is smaller, but otherwise resembles the one described.

5. *Comissia gracilipes* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 19.

Stat. 266. 5° 56′.5 S., 132° 47′.7 E. 595 Metres. 6 Ex.
Stat. 267. 5° 54′ S., 132° 56′.7 E. 984 Metres. 2 Ex.

The largest of the six specimens from Stat. 266 has the arms 40 mm. long; the cirri have been lost.

The larger example from Stat. 267 has been chosen as the type; the centrodorsal is large, discoidal, with a broad flat dorsal pole 2 mm. in diameter; the cirrus sockets are arranged in a single very closely crowded marginal row.

The cirri are lacking; but in the smaller specimen the cirri are XX, in one and a partial second row, the latter apparently undergoing suppression; there are also traces of the sockets of a third row. The cirri have 9 segments and are from 4 mm. to 4.5 mm. long; the first segment is nearly or quite twice as broad as long, the second is slightly longer than broad, the third is about three times as long as the diameter of the proximal end, the fourth is slightly longer, and the fifth is about as long as the third; the sixth is about twice as long as the diameter of the distal end; the seventh is slightly shorter; the antepenultimate is half again as long as broad, and the penultimate is about as long as broad. The longer earlier

segments are slightly constricted centrally with expanded ends as is usual in the genus. The dorsal processes on the outer segments are almost obsolete.

The ten arms, which resemble those of *C. parvula*, are between 30 mm. and 35 mm. long.

The mouth is central or subcentral, the anal tube marginal or submarginal.

P_1 is 7 mm. long and bears a terminal comb consisting of 11 long teeth.

6. *Comissia parvula* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 19.

Stat. 95. 5°43′.5 N., 119°40′ E. 522 Metres. 1 Ex.
Stat. 105. 6°8′ N., 121°19′ E. 275 Metres. 5 Ex.
Stat. 294. 10°12′.2 S., 124°27′.3 E. 73 Metres. 2 Ex.
Stat. 302. 10°27′.9 S., 123°28′.7 E. 216 Metres. 2 Ex.
Label not legible. 1 Ex.

The centrodorsal is large, discoidal, the dorsal pole flat, 2 mm. to 2.5 mm. in diameter; the cirrus sockets are in two marginal rows.

The cirri are XX—XXIII, 9—13 (usually 11), 7 mm. to 9 mm. long, resembling those of *C. hispida* but slightly more slender.

The arms are slender, 45 mm. long.

The specimen from Stat. 95 has the cirri about XX, 11, 7 mm. long; the dorsal pole of the centrodorsal is 2 mm. in diameter.

The largest example from Stat. 105 has the cirri XXII, 10—11, 7 mm. long; the dorsal pole of the centrodorsal is 2.5 mm. in diameter; the ovaries contain mature, or almost mature, eggs. The four others are very small.

The specimens from Stat. 294 have cirri with 10 segments, 6 mm. long; the arms are 45 mm. long.

Those from Stat. 302 have 9—11 cirrus segments, and resemble the preceding.

The individual with the label illegible has the cirri XXIII, 11—13, 9 mm. long; the dorsal pole of the centrodorsal is flat, 2 mm. in diameter; ripe eggs are present. The arms are 45 mm. long.

In addidion to the specimens detailed above I have at hand the following:

Tawi Tawi group, Philippine Islands, 230 fathoms ("Albatross" Stat. 5162; Cat. N° 36003 U. S. National Museum).

Doworra Island, Moluccas, 205 fathoms ("Albatross" Stat. 5629; Cat. N° 36019 U. S. National Museum).

This species is very close to *C. hispida*, but is smaller, more delicate, and more slender; the cirri, while resembling in structure those of *C. hispida*, are arranged in two rows instead of in a single row on the centrodorsal, and are more slender and more numerous.

The very small specimens of the species of this genus may be distinguished from the ten armed young of multibrachiate species by the very short IBr series the elements of which appear to be united by syzygy.

2nd Subfamily Comactiniinae A. H. Clark.

Key to the Genera of the Subfamily Comactiniinae.

a[1] No cirri

b[1] 20 arms (northern Australia and the Aru Islands) . . **Validia** (subg.)

b[2] 10 arms (Australia, except the southern coast, and northward to the Andaman Islands, Singapore, Hongkong and the Philippines) . . . . . **Comatula** (subg.)

a[2] Cirri present

b[1] more than 30 cirrus segments which, except the penultimate, are twice as broad as long, or even broader (southern Australia) **Comatulella**

b[2] fewer than 25 cirrus segments of which at least some, and commonly all, are longer than broad

c[1] ossicles of the IBr series short and very broad and, usually with the first two brachials, in lateral apposition; segments of the genital pinnules short and broad (usually much broader than long in the basal half of the pinnule) and more or less produced distally; only exceptionally more than XX cirri, which are usually short and rather stout

d[1] ossicles of the IBr series and first two brachials united by pseudosyzygy, the union appearing externally as a uniformly narrow, or dotted, line; two or more of the basal segments of the proximal pinnules usually bear a prominent carinate process (Australia, excepting the southern coast, and northward to the Andaman Islands, Singapore, Hongkong and the Philippine Islands) . . . . . **Comatula**

d[2] ossicles of the IBr series and first two brachials united by synarthry, the line of union appearing externally as two very narrow triangles converging to a common apex in the median line; no carinate processes on the basal segments of the proximal pinnules (western Atlantic, from North Carolina to Brazil, including the Caribbean Sea). . . . . **Comactinia**

c[2] ossicles of the IBr series longer and narrow, widely free laterally; segments of the genital pinnules beyond the first two as long as, or longer than, broad; XXIV—XL cirri, which are long and slender, and strongly compressed laterally (Lesser Sunda Islands and southwestern Japan) . **Comatulides**

Comatula Lamarck.

Subgenus **Validia** A. H. Clark.

Key to the Species of the Subgenus Validia.

a^1 All of the arms the same length (northern Australia and the Aru Islands) . . . . . *rotalaria*

a^2 The outer arms arising from each IIBr series are much shorter than the inner (northwestern Australia and the Aru Islands) . . . . . *etheridgei*

1. *Comatula (Validia) rotalaria* (Lamarck).

LAMARCK. Hist. nat. des animaux sans vertèbres, vol. 2, 1816, p. 534.
P. H. CARPENTER. Proc. Roy. Soc., vol. 28, 1879, p. 390 (*Actinometra jukesii*).
BELL. "Alert" Report, 1884, p. 168 (*Actinometra jukesi*); p. 169, pl. 17, figs. A, A*a* (*Actinometra paucicirra*).
BELL. Proc. Linn. Soc. New South Wales, vol. 9, 1885, p. 498 (*Actinometra jukesi*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 291, pl. 4, fig. 6; pl. 5, fig. 3; pl. 54 (*Actinometra paucicirra* and *Act. aruensis*).
DÖDERLEIN. Denkschr. Ges. Jena, vol. 8, 1898. p. 479 (*Actinometra paucicirra*).
A. H. CLARK. Bull. du Mus. d'hist. nat., Paris, N° 4, 1911, p. 247.
—— Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, pp. 437, 440, 443—445.
—— Recent Crinoids of Australia, 1911, p. 739.
—— Crinoids of the Indian Ocean, 1912, p. 79.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 8.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 83.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 224.

Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 1 Ex.

This is a particularly fine specimen with 20 arms 165 mm. long, the posterior arms being 120 mm. long; all of the arms are grooved; the centrodorsal exactly fills the space between the radials, its surface being on precisely the same level as theirs so that its borders are difficult to detect.

2. *Comatula (Validia) etheridgei* A. H. Clark.

A. H. CLARK. Recent Crinoids of Australia, 1911, p. 741.
—— Die Fauna Südwest-Australiens. vol. 3, 1911, part 3, pp. 440, 444, 445.
—— Crinoids of the Indian Ocean, 1912, p. 79.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913 N° 15, p. 8.
—— Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 224.

Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 5 Ex.

The largest specimen has the inner arms 45 mm. long and the longest outer arms 20 mm. long; some of the outer arms are not so long as the pinnules which they bear; these

taper abruptly and are composed of six brachials which decrease rapidly in diameter and do not bear pinnules, and terminate at the fourth segment of the first pinnule; the cirri are VII, 12, 6 mm. long, very slender; all the segments are subequal, rather more than half again as long as broad, without dorsal processes; the cirri are confined to the interradial angles of the centrodorsal occurring in two pairs with one at each of the remaining three angles.

Fig. 1.
Diagrammatic dorsal view of *Comatula etheridgei*, based upon the specimens from Stat. 273. Natural size. (Courtesy of the U. S. National Museum).

A second specimen has the inner arms 40 mm. long and the outer up to 30 mm. in length; the cirri are VIII, in four interradial pairs.

A third has the inner arms 40 mm. long and the outer up to 11 mm. in length; the cirri are VII, three occurring singly and the others in two interradial pairs.

A fourth has the inner arms 30 mm. long and the outer up to 10 mm. in length (from the axillary); the cirri are VII, resembling those in the first described.

The last has the inner arms 30 mm. long; none of the short arms are longer than the pinnule borne by the same axillary.

All of the specimens are light yellow brown in colour.

In spite of the unique arm structure it is quite possible that this is merely the young of *C. rotalaria*. It will be remembered that in *Promachocrinus kerguelensis* the so-called "interradial" rays and arms do not begin to form until after the first five (radial) rays and arms have attained a very considerable size, and they do not attain the length and stoutness of the latter until the animal is nearly fully grown.

Subgenus **Comatula** Lamarck.

Key to the Species of the Subgenus Comatula.

a[1]. No cirri

b[1] anterior arms more than 100 mm. (usually from 125 mm. to 150 mm.) in length (northern Australia to western Java, Singapore, Hong Kong and the Philippine Islands) . . . . . *solaris*[1])

c[1] the arms are very stout and flat dorsally, increasing in lateral diameter to the twelfth-fourteenth brachials and tapering distally from that point onward (northern Australia). . . . . var. *solaris*

c[2] the arms are slender and well rounded dorsally, not increasing appreciably in diameter from the base (northern Australia to western Java, Singapore, Hong Kong and the Philippine Islands) . . . . . var. *hamata*

1) Synonyms *Actinometra imperialis* J. Müller; *Actinometra albonotata*, *Act. intermedia* and *Act. strota* Bell; and *Act. rotalaria* and *Act. strata* P. H. Carpenter.

b² anterior arms not more than 65 mm. long (Burma to the Andaman and Lesser Sunda Islands). . . . . *micraster*

a² Cirri present

b¹ 16—25 (usually about 20) cirrus segments (northern Australia to western Java, Singapore, Hong Kong and the Philippine Islands). . . . . *solaris*

c¹ the arms are very stout and flat dorsally, increasing in lateral diameter to the twelfth-fourteenth brachials and tapering distally from that point onward (northern Australia). . . . . var. *solaris*

c² the arms are slender and well rounded dorsally, not increasing appreciably in diameter from the base (northern Australia to western Java, Singapore, Hong Kong and the Philippine Islands). . . . . var. *hamata*

b² fewer than 16 cirrus segments

c¹ the cirri are distributed, regularly or irregularly, all around the periphery of the centrodorsal, without segregation in the interradial angles (Baudin Island, Western Australia, and New South Wales to Singapore and the Philippine Islands). . . . . *pectinata*[1])

c² the cirri are segregated in the interradial angles of the centrodorsal, where they occur singly or in pairs

d¹ the longest cirrus segments are not much, if at all, longer than broad (western and northern Australia to the Philippine Islands). . . . . *purpurea*

d² the longest cirrus segments are twice as long as broad (Java Sea) *tenuicirra*

1. *Comatula (Comatula) micraster* A. H. Clark.

A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 81, fig. 2, pp. 82, 315.

Stat. 33. Bay of Pidjot, Lombok. Up to 22 Metres. 1 Ex.

This is a typical specimen; on the label is written "killed in fresh water."

2. *Comatula (Comatula) purpurea* (J. Müller).

J. Müller. Archiv für Naturgesch., 1843, I, p. 132 *(Alecto purpurea)*.
A. H. Clark. Proc. Biol. Soc. Washington, vol. 23, 1910, pp. 95—98, fig. p. 97.
—— Bull. du Mus. d'hist. nat., Paris, 1911, N⁰ 4. p. 247.
—— Recent Crinoids of Australia, 1911, p. 746.
—— Crinoids of the Indian Ocean, 1912, p. 81.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N⁰ 10, p. 5.
—— Proc. U. S. Nat. Mus., vol. 43, 1912, p. 389.
Reichensperger. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, part 1, p. 86.
A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N⁰ 15, p. 9.
—— Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 120.

1) Synonyms *Comatula cumingii* J. Müller and *Actinometra affinis* Lütken.

H. L. CLARK. Carnegie Institution of Washington Publication, N° 212, 1915, p. 101.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 224.

Stat. 37. Sailus Ketjil, Paternoster Islands. 27 Metres and less. 1 Ex.
Stat. 49ª. 8° 23′.5 S., 119° 4′.6 E. 69 Metres. 3 Ex.
Stat. 61. Lamakera, Solor Island. Reef. 1 Ex.
Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 Metres. 2 Ex.
Stat. 144. Anchorage north of Salomakieë (Damar) Island. Reef. 1 Ex.
Stat. 250. Anchorage off Kilsuin, western coast of Kur Island. 20—45 Metres. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 25 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 Metres. 2 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 Metres. 41 Ex.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. 34 Metres. 2 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 Metres. 14 Ex.
Stat. 301. 10° 38′ S., 123° 25′.2 E. Reef. 1 Ex.
Stat. 303. Haingsisi, Samau Island. Reef. 4 Ex.
Stat. 318. 6° 36′.5 S., 114° 55′.5 E. 88 Metres. 2 Ex.

The details of the specimens are as follows:

Stat. 37; one typical example with arms 55 mm. long.

Stat. 49ª; three small specimens of which the largest has arms 25 mm. long, and cirri VI.

From the reef at Lamakera (Stat. 61) there is a very small example with the arms only 25 mm. long.

Stat. 99; two small individuals with arms 30 mm. long and cirri X, in five interradial pairs.

Stat. 144; a small specimen with the arms 45 mm. long, and V cirri; the interradial areas of the visceral mass proximal to P_1 are filled with calcareous deposit.

Stat. 250; a small example with arms 35 mm. long; the cirri are IX, very slender; the disk has been lost, but the interradial areas proximal to the bases of the P_1 are filled with a strong calcareous webbing.

Stat. 273; a four-rayed specimen from this station has the anterior arms 70 mm. long, the posterior arms being 45 mm. long; the cirri are VI, four arranged in two interradial pairs, the other two occurring singly; the anterior ray is missing; the mouth is slightly to the left of the base of the left derivative from the ray just to the right of it; the arm at the left of the mouth and the three to the right are grooved; the other four are ungrooved.

A specimen with arms about 70 mm. long, four of them ungrooved, has the cirri VII.

Another individual has the arms about 55 mm. long, and stout; five arms are grooved and five are ungrooved; the cirri are VII, arranged in two interradial pairs, with three occurring individually; the disk is regenerating, and the course of the digestive tube is shown by a broad spiral about the anal cone.

Two specimens have the anterior arms 55 mm. long and the posterior 35 mm. long; four of the arms are ungrooved and six are grooved; the cirri are V, in one occurring individually in each interradial angle, in the other absent from one of the interradial angles.

An example with arms 50 mm. long has the cirri VI, four arranged in two interradial pairs and two occurring individually; one of the interradial angles is vacant.

Another with the anterior arms 50 mm. long and the posterior arms 30 mm. long has the cirri V, one in each interradial angle; there are four ungrooved and six grooved arms.

A small individual with arms 30 mm. long has V cirri.

A still smaller one with arms only 15 mm. long has the cirri VIII, arranged in two interradial pairs with three occurring individually.

There are fourteen specimens additional similar to the preceding, and two very small.

Stat. 274; two large individuals with the arms moderately swollen.

Stat. 282; the largest example has arms 60 mm. long and cirri II; four have arms 45 mm. long and cirri III, III, IV and VIII; one has arms 30 mm. long and cirri VI; there are eighteen others.

In another lot from the same station there are seventeen specimens with arms ranging from 12 mm. to 40 mm. in length; most of them have V cirri, one in each interradial area; the smallest has VI cirri arranged in two interradial pairs with two occurring individually, one of the interradial angles being vacant.

From Stat. 285 there are two small specimens.

Stat. 299; the largest specimen has arms 45 mm. long and cirri V; three others have arms 40 mm. long and cirri III, V and VIII; another has the arms 35 mm. long and the cirri V; there are nine others.

A small example from the reef at Stat. 301 has the arms about 40 mm. long and the cirri IX, two being very small.

The largest individual from the reef at Haingsisi (Stat. 303) has the anterior arms 85 mm. long and the posterior 50 mm. long; the cirri are II, but there are sockets for four more; another has the anterior arms 80 mm. long and the posterior 45 mm. long; the cirri are III; the two additional specimens are small.

The larger specimen from Stat. 318 has eleven arms 125 mm. long; the arms are of the slender type and, except for the arrangement of the cirri, the animal bears a close resemblance to that upon which LÜTKEN based the name *affinis*; the cirri are VI, four in two interradial pairs and two occurring singly. The smaller example has ten arms 85 mm. long; the cirri are VIII, two occurring singly, the remainder in three interradial pairs.

3. *Comatula (Comatula) tenuicirra* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 20.

Stat. 320. 6° 5′ S., 114° 7′ E. 82 Metres. 8 Ex.

This species exactly resembles the slender armed form of *C. (C.) purpurea* except for the longer and more slender cirri.

In the largest specimen, which has the anterior arms 125 mm. long (the posterior arms are broken), the cirri are IX, 14—15, 13 mm. to 15 mm. long; they are arranged in four interradial pairs, with one occurring singly; the first segment is short, the second nearly as long as broad, the third from one third to one half again as long as broad, the fourth and fifth twice as long as the median diameter; the following segments gradually become slightly shorter so that the third before the antepenultimate is about one third longer than broad, the next

slightly longer, the antepenultimate half again as long as broad, and the penultimate very slightly longer than broad. The cirri are very slender, of the same type as the slender form of cirri found in *purpurea* and *pectinata*. The second and third segments of the proximal pinnules are very strongly carinate.

Of the remaining specimens one has the arms 80 mm. long and the cirri V; another has the arms 55 mm. long and the cirri VII; a third has the arms 50 mm. long and the cirri IV; two others have the arms 40 mm. and 35 mm. long and the cirri V; the remaining two are small.

The cirri of these small examples are extremely delicate.

The colour is yellow brown; some of the specimens have a line of dull purple on either side of the median dorsal line, and one in addition has a spot of purple on each of the pinnule segments.

4. *Comatula (Comatula) pectinata* (Linné).

LINNÉ. Syst. Nat., 10th edition, 1758, p. 663 (*Asterias pectinata*; type specimen, but not the references cited).
J. MÜLLER. Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 255 (*Comatula cumingii*).
P. H. CARPENTER. Trans. Linn. Soc. (Zoöl.), series 2, vol. 2, 1879, p. 27, pl. 5, figs. 5—9; pl. 8, figs. 5—8 (*Actinometra pectinata*).
—— Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 517 (*Actinometra pectinata* and *Act. affinis*).
BELL. "Alert" Report, 1884, p. 161 (*Antedon irregularis*, part); p. 164 (*Actinometra solaris*, part); p. 170 (*Actinometra* sp. juv.).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 284, pl. 53, figs. 15—22 (*Actinometra pectinata*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 107 (*Actinometra pectinata*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 394 (*Actinometra pectinata* and *Act. parvicirra*, part).
KOEHLER. Mem. soc. zool. France, vol. 8, 1895, p. 422 (*Actinometra pectinata*).
DÖDERLEIN. Denkschr. Ges. Jena, vol. 8, 1898, p. 478 (*Actinometra pectinata*).
PFEFFER. Abhandl. der Senck. naturforsch. Ges., vol. 25, 1900, p. 85 (*Actinometra pectinata*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 202.
—— Proc. U. S. National Museum, vol. 36, 1909, p. 394.
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 148.
—— Proc. U. S. National Museum, vol. 39, 1911, p. 532.
—— Recent Crinoids of Australia, 1911, p. 744.
—— Notes from the Leyden Museum, vol. 33, p. 177.
—— Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, pp. 437, 439, 443, 444, 446.
—— Crinoids of the Indian Ocean, 1912, p. 80.
—— Proc. U. S. National Museum, vol. 43, 1912, p. 389.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 10.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 101.
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.

Stat. 49a. 8° 23′.5 S., 119° 41′.6 E. 69 Metres. 58 Ex.
Stat. 50. Bay of Badjo, western coast of Flores. Up to 40 Metres. 4 Ex.
Stat. 79. 2° 43′ S., 117° 44′ E. 41—54 Metres. 1 Ex.
Stat. 79b. Pulu Kabala-dua, Borneo Bank. Reef. 1 Ex.
Stat. 96. Southeastern side of Pearl Bank, Sulu Archipelago. 15 Metres. 1 Ex.

Stat. 99. 6° 7′.5 N., 120° 26′ E. 16—23 Metres. 12 Ex.
Stat. 162. Between Loslos and Broken Island, western coast of Salawatti. 18 Metres. 20 Ex.
Stat. 164. 1° 42′.5 S., 130° 47′.5 E. 32 Metres. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 M. 2 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 Metres. 1 Ex.
Stat. 285. 8° 39′.1 S., 127° 4′.4 E. 34 Metres. 6 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 Metres. 1 Ex.
Stat. 299. 10° 52′.4 S., 123° 1′.1 E. 34 Metres. 1 Ex.

The details of the specimens are as follows:

Stat. 49[a]; twenty-seven of these are fully grown, with the arms up to about 130 mm. in length, while thirty-one represent various immature stages. All are, more or less pronouncedly, of the broad armed type. One of the fully grown is purple, the others being yellow brown; one of the young is orange, the others yellow or yellow brown. This series closely resembles that from Stat. 162.

Stat. 50; two of the specimens have the anterior arms about 110 mm. long; another has the anterior arms 90 mm. long and the posterior 60 mm. long, with four ungrooved; the last is small. The arms are rather slender, with only a suggestion of an approach to the stout type.

Stat. 79; the arms are about 90 mm. long, of the slender type; the cirri are XII, 13—14.

Stat. 79[b]; a small individual, the arms being only 27 mm. long.

Stat. 96; another small specimen, with arms 25 mm. long.

Stat. 99; the largest has arms 75 mm. long and XIII cirri; another has arms 70 mm. long, the posterior arms 55 mm. long, and XI cirri; this example has eleven arms; there are four others similar to the preceding, and six more medium and small, all of the slender armed type.

Stat. 162; the largest has the anterior arms 135 mm. and the posterior 85 mm. in length, all very broad and stout; five of the arms are ungrooved; another large specimen has the anterior arms 120 mm. and the posterior 60 mm. long; five of the arms are ungrooved; a third has the anterior arms about 100 mm. and the posterior 60 mm. long, all stout and broad; five of the arms are ungrooved, and on the others only the distal pinnules are grooved; a fourth, also of the broad armed type, has the posterior arms 60 mm. long, very stout, stouter than the anterior arms; five of the arms are ungrooved; the cirri are X, 10—11, 8 mm. to 9 mm. long; a fifth resembles the preceding; the eight medium sized specimens all have broad and stout arms, this character being especially marked in the posterior; usually five of the arms are ungrooved; the seven small specimens are similar; the broadening of the arms is marked in individuals with an arm length of only 35 mm. or 40 mm.

Stat. 164; the anterior arms are 120 mm., the posterior 70 mm. in length; six of the arms are grooved and four ungrooved; on the former only the distal pinnules are grooved; all the arms are rather stout, but not excessively so; the centrodorsal is greatly reduced, and bears only two cirri, one 7 mm. long with 12 segments, the other 6.5 mm. long with 11; there are also two rudimentary cirri; the colour is yellow brown, each articulation with two dark spots one on either side of the median line; the articulations in the basal portion of the pinnules bear single dark spots.

Stat. 273; the larger specimen has the anterior arms 120 mm. and the posterior 45

mm. in length; the cirri are XIV, 10, 7 mm. to 9 mm. long; the arms are moderately stout, five grooved and five ungrooved; the colour is yellow brown with a narrow mediodorsal line of lighter; the pinnules are deep violet; the smaller specimen has the arms 80 mm. long, moderately swollen, and the cirri XIII.

Stat. 282; the anterior arms are 150 mm. long and the posterior 70 mm.; four of the arms are ungrooved; the arms are very stout, especially the posterior; the cirri are stout and strongly curved, XII, 12—13.

Stat. 285; the largest example has the anterior arms 95 mm. long and the posterior 45 mm.; the arms are moderately stout; six are grooved and four are ungrooved; the cirri are XIII; a second individual is similar, but slightly smaller; the last is small, with the arms about 20 mm. long; the pseudosyzygy between the elements of the IBr series and that between the first two brachials are perfectly developed.

Stat. 294; one young specimen.

Stat. 299; one specimen with moderately stout arms 115 mm. long.

This series of specimens shows that the pseudosyzygy between the elements of the IBr series and the first two brachials is perfected at a very early age, and furnishes an important generic character. Furthermore the brachials of the species of *Comatula* always have smooth edges, while those of the most closely allied genus, *Comactinia*, have spinose edges. In *Comatula purpurea* the characteristic arrangement of the cirri is evident in very small individuals.

Comatulides A. H. Clark.

Key to the Species of the Genus Comatulides.

a^1 Cirri XXII—XXIV, 12—15; division series and proximal portion of arms without synarthrial or articular tubercles (Lesser Sunda and Kei Islands) . . . *australis*

a^2 Cirri XL, 16—17; division series and proximal portion of arms rugged, with strongly developed synarthrial and articular tubercles (southwestern Japan) . *decameros*

1. *Comatulides australis* (A. H. Clark).

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 21 (*Cominia australis*).

Stat. 267. 5° 54′ S., 132° 56′.7 E. 984 Metres. 1 Ex.
Stat. 297. 10° 39′ S., 123° 40′ E. 520 Metres. 1 Ex.

The specimen from Stat. 267 is slightly larger than the type (from Stat. 297), having the arms about 100 mm. long; the centrodorsal is thin discoidal, very broad, with the circular dorsal pole flat, 4.5 mm. in diameter; the cirri are XXII (with a number undeveloped), 13—15 (usually 14—15), 15 mm. to 19 mm. long, arranged in a single irregular marginal row; P_1 is 20 mm. long; P_3 is 18 mm. long; the elements of the division series and the brachials and pinnulars are covered with a prominent fine dermal granulation.

Stat. 297; the centrodorsal is thin discoidal with the bare dorsal pole flat, 2.0 mm. in diameter; the cirrus sockets are arranged in three closely crowded roughly alternating marginal and submarginal rows.

The cirri are XXIV, 12—13, 13 mm. to 15 mm. long; the first segment is short, the second nearly or quite twice as broad as long, the third twice as long as the diameter of the ends, the fourth-sixth three times as long as the median diameter, the following decreasing in length so that the antepenultimate is about one third again as long as broad; the opposing spine is represented by a slight subterminal tubercle; the terminal claw is longer than the penultimate segment, rather stout, moderately curved; the longer proximal cirrus segments have slightly swollen distal ends, this character gradually disappearing as the segments become shorter; the eighth or ninth segment becomes lighter in colour distally, and is a slightly marked transition segment, though the preceding segments are smooth like the following; the last four or five segments before the penultimate have their distal dorsal margin very slightly thickened; the cirri are moderately compressed laterally, this increasing slowly and uniformly from the base to the short outer segments.

The subradial clefts are very narrow and very deep. The ends of the basal rays are very prominent as rounded tubercles in the angles of the calyx.

The radials are concealed in the median line, being visible only at the side of and above the ends of the basal rays; their distal angles are separated interradially by a prominent V-shaped gap; the IBr_1 are very short, slightly trapezoidal, narrower distally than basally, three times as broad as long; they are very widely separated laterally, the sides of adjacent IBr_1 making rather more than a right angle with each other; the axillaries are very broadly pentagonal, almost triangular, about twice as broad as long; the lateral edges are about half as long as those of the IBr_1, and make slightly more than a right angle with them.

The ten arms, which were probably about 90 mm. long, resemble those of *C. decameros*, but are not so rugged and show only traces of the synarthrial and articular tubercles.

The ossicles of the division series and the lower brachials are covered with fine dermal granulations.

P_1 is 15 mm. long, composed of 42 segments; the comb occupies 19 segments, arising very gradually; the teeth are low, well separated, and well rounded distally, in height not reaching the lateral diameter of the segments which bear them; the second-fourth or -fifth segments of the pinnule have prominent and coarsely spinous ends. P_2 is 12 mm. long, similar to P_1 but smaller and proportionately less stout. P_3 is 7 mm. long, very slender, proportionately smaller and more slender than P_2, P_4 is 6.5 mm. long, slightly stouter than P_3, without a comb, slightly stouter than P_3, though becoming very slender distally. The distal pinnules are 12 mm. long with 23 segments which have prominent articulations.

This species differs from *C. decameros* in having fewer cirri which are composed of fewer segments and are very slightly stouter and less compressed laterally. The synarthrial and articular tubercles are not so prominent as in *C. decameros*, but the rugged character of the arm bases is indicated, and might become prominent in larger examples.

3rd Subfamily Comasterinae A. H. Clark.

Key to the Genera of the Subfamily Comasterinae.

a[1] IIBr series 4 (3 + 4); further division series 2 (1 + 2) or 2; proximal pinnules more slender than the succeeding; terminal combs occur at intervals on the middle and distal pinnules (Andaman Islands to northern Australia, New Britain, the Philippine Islands, the Gilbert [Kingsmill] Islands, southern Japan, and China) . . **Comaster**

a[2] Some or all of the IIIBr and following division series 4 (3 + 4); no division series 2 (1 + 2); proximal pinnules stouter than the following; terminal combs confined to the proximal pinnules

b[1] IIIBr series 2; IIBr series 4 (3 + 4); IVBr series in part or entirely 4 (3 + 4) (northern Australia to west Java, the Moluccas, the Philippine Islands, China and southern Japan) . **Comantheria**

b[2] some or all of the IIIBr series 4 (3 + 4)

c[1] outer IIIBr series on each ray 2, inner 4 (3 + 4); following series entirely or mostly 4 (3 + 4); cirri only exceptionally present (Maldive Islands to northern Australia, New Britain, the Philippines, and the Caroline Islands). . . . . **Comanthina**

c[2] IIIBr series usually all 4 (3 + 4); if IIIBr series of 2 are present there is no regularity in their occurrence (southern and southeastern Africa, Ceylon, and eastward to northern Australia, Oceania, and southern Japan) **Comanthus**

d[1] cirri few, small and weak, slightly if at all compressed distally, irregularly distributed on the centrodorsal, or absent altogether; one or more of the division series usually 2 instead of 4 (3 + 4), but the division series of 2 have no regular arrangement (Madagascar and Mauritius to Ceylon, thence to northern Australia, New Caledonia, the Friendly, Tonga, Fiji, Samoan, Pelew, Gilbert [Kingsmill] and Caroline Islands, southern Japan, and Amoy, China). . . . . **Vania** (subg.)

d[2] cirri always present and numerous, well developed, laterally compressed distally, evenly distributed about the periphery of the centrodorsal; all the division series 4 (3 + 4) (southern and southeastern Africa; Tasmania and southern Australia and northward to the Bay of Bengal, Samoa, the Marshall Islands, and southern Japan). . . . . **Cenolia** (subg.)

Comaster L. Agassiz.

Key to the Species of the Genus Comaster.

a^1 Cirri absent

b^1 IIIBr series on the outer side of each IIBr series 2, those on the inner side being 4 (3 + 4); more than 60 (usually more than 100) arms (northern Australia) . . . . . *belli*

b^2 IIIBr series all 2 (1 + 2) or 2

c^1 80 or more arms over 80 mm. (usually over 100 mm.) long (northern Australia to Fiji, the Gilbert [Kingsmill] Islands, the Philippines and Singapore) . . . . *novaeguineae* [1])

c^2 less than 80 arms

d^1 45—80 (usually 50—60) arms (Pulo Edam, China Sea, to Singapore) . . . . . *gracilis*

d^2 not more than 45 arms

e^1 IIIBr series developed only on the outer side of each IIBr series; IVBr series developed only on the inner side of each IIIBr series; rather stout (northern Australia) . . . . . *multifida* [2])

e^2 IIIBr series developed on both the inner and outer side of each IIBr series; IVBr series rarely present; very slender and delicate (Rotti, the Philippine and Paternoster Islands) . . . . . *minimus*

a^2 Cirri present

b^1 usually between 100 and 150 arms

c^1 IIIBr series on the outer side of each IIBr series 2, those on the inner side being 4 (3 + 4); cirri large and stout with 17—18 segments, but more or less deficient, only very exceptionally being developed all around the periphery of the centrodorsal (northern Australia) . . . . . *belli*

c^2 IIIBr series all 2 (1 + 2) like the following series; cirri large and well developed, numerous, with 13—16 segments, evenly distributed all around the periphery of the centrodorsal (Lesser Sunda Islands and Moluccas to the Philippine Islands) . . . . . *multibrachiata*

b^2 not more than 65 arms

c^1 45—63 arms

d^1 usually about 60 (37—63) arms 90 mm. to 150 mm. long; all the IIIBr series developed; no interradial plating;

1) Synonyms: *Phanogenia typica* Lovén and *Actinometra stellata* Lütken.
2) Synonym: *Actinometra variabilis* Bell.

cirri numerous, composed of 8—13 segments, well developed though short and strongly curved

e^1 cirri shorter and stouter, not more than one tenth of the arm length; longest cirrus segment not more than three times as long as the median diameter; antepenultimate segment never longer than broad, and penultimate segment broader than long

f^1 12—13 cirrus segments of which the longest (3^{rd}—5^{th}) are half again as long as broad or at most only slightly longer; 7^{th} and following with slightly everted distal dorsal ends; 9^{th} and 10^{th} and following broader than long; arms 150 mm. long (China) . . . . . *schönovi* [1])

f^2 8—11 cirrus segments of which the longest (3^{rd}) is three times as long as the median breadth; the following decrease in length so that the antepenultimate is about as long as broad and the penultimate slightly broader than long; the 4^{th} and following have slight dorsal processes; arms 90 mm. long (Lesser Sunda to the Philippine Islands) . . . . . *fruticosus* [2])

e^2 cirri longer and more slender, more than one tenth of the arm length; longest cirrus segment (3^{rd}) from three to three and one half times as long as the median diameter, the following rapidly becoming shorter so that the antepenultimate is slightly longer than broad and the penultimate about as long as broad; the sixth and following have sharp and prominent dorsal processes (Java Sea) . . . . *sibogae*

d^2 45 arms; IIIBr series developed only on the outer side of each IIBr series; IVBr series developed only on the inner side of each IIIBr series; interradial perisome heavily plated; cirri few, more or less deficient (northern Australia) . . . . . *multifida*

c^2 less than 45 arms

d^1 35—40 arms

e^1 15—18 cirrus segments

f^1 elements of the IBr and IIIBr series, and first two ossicles in the IIBr series, united by a

1) *Comaster novaeguineae* (not of J. Müller) A. H. Clark, Vid. Medd. fra den naturhist. Forening i København, 1909, p. 141.
2) Synonym: *Comaster philippinensis* A. H. Clark.

very evident synarthry; IIIBr 2; IVBr 2, but irregular in occurrence; 36 arms about 100 mm. long; cirri XX—XXII, 16—18, 13 mm. to 15 mm. long; cirrus segments from the 11th or 12th onward bearing just proximal to the middle a rounded dorsal tubercle in addition to the sharp subterminal tubercle; terminal combs occur on most of the genital pinnules as well as on many of the distal pinnules (Tawi Tawi group, Philippine Islands) . . . . . *taviana*

f² elements of the IBr and IIIBr series united by pseudosyzygy or syzygy as usual; 37 arms 85 mm. long; cirri XXVII, 15—17, 12 mm. to 15 mm. long (Kei Islands) . . . . . *pulcher*

e² 10—11 cirrus segments; 40 arms 60 mm. to 70 mm. long; cirri 8 mm. long (Andaman Islands to the Lesser Sunda Islands, the Aru Islands and the Moluccas) . . . . . *parvus*

d² 30—33 arms

e¹ 24—25 cirrus segments; cirri long and stout, only gently curved distally, nearly one third of the arm length; colour white, with lines and bands of violet (Lesser Sunda to the Philippine Islands) . *delicata*

e² 9—13 cirrus segments; cirri very short and strongly curved, not more than one seventh of the arm length; colour yellow or yellow brown

f¹ longest cirrus segments (4th) about twice as long as broad; cirri VIII—XXIII, 9—13; 30—33 arms 80 mm. to 100 mm. long (Lesser Sunda and Kei Islands to the Moluccas and the Philippine Islands). . . . . *distincta*

f² longest cirrus segments (3rd and 4th) three times as long as broad; cirri XV, 10; 30 arms (southern Japan) . . . . . *serrata*

1. *Comaster novaeguineae* (J. Müller).

J. Müller. Archiv für Naturgesch., 1841, I, p. 146 (*Alecto novae-guineae*).
Lovén. Ofversigt k. Vetensk.-Akad. Förhandl., 1866, N⁰ 9, p. 231, fig. p. 220, *a—h* (*Phanogenia typica*).
Herklots. Bijdragen tot de Dierkunde, Afl. 13, 1869, p. 11, pl. 10 (*Comatula novae-guineae*).
Lütken. Cat. Mus. Godeffroy, vol. 5, 1874, p. 190 (*Actinometra stellata*; nomen nudum).
P. H. Carpenter. Proc. Roy. Soc., vol. 28, 1879, p. 390 (*Actinometra stellata*).

P. H. CARPENTER. Notes from the Leyden Museum, vol. 3, 1881, p. 193 (*Actinometra novae-guineae*); p. 195 (*Actinometra typica*).
BELL. "Alert" Report, 1884, p. 169 (*Actinometra multifida*, part; *Actinometra variabilis*, part).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 295 (*Actinometra typica* and *Act. novae-guineae*); p. 296, pl. 57, fig. 1 (*Actinometra typica*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 108 (*Actinometra typica*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra regalis*).
BELL. Willey's Zoölogical Results, part 2, 1899, p. 134 (*Actinometra typica*, part).
PFEFFER. Abhandl. der Senck. naturforsch. Ges., vol. 25, 1900, p. 85 (*Actinometra novae-guineae*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 203 (*Phanogenia typica*).
—— Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 365 (*Comaster typica*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 139 (*Comaster typica*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 177 (*Comaster typica*); p. 178 (*Comaster novae-guineae*).
—— Recent Crinoids of Australia, 1911, p. 747 (*Comaster typica*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, pp. 437, 439, 443, 444, 446, 453 (except the specimens described) (*Comaster typica*).
—— Crinoids of the Indian Ocean, 1912, p. 83 (*Comaster typica*); p. 87 (*C. novae-guineae*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 6 (*Comaster typica* and *C. novae-guineae*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 12 (*Comaster typica*).
—— Die Fauna Südwest-Australiens, vol. 4. 1913, part 6, p. 314 (*Comaster typica*).
—— Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222 (*Comaster typica*).

The following citations do not refer to this species:

BELL. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, part 3, p. 225 (*Actinometra typica*) = *Comanthina schlegelii*.
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 204 (*Phanogenia novae-guineae*) = *Comaster fruticosus*.
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 141 (*Comaster novae-guineae*) = *Comaster schönovi*.
—— Die Fauna Südwest-Australiens, vol. 3, 1911, part 13, p. 453 (*Comaster typica*; the specimens described) = *Comaster belli*.

Stat. 89. Pulu Kaniungan ketjil. 11 Metres. 1 Ex.
Stat. 231. Amboina. 1 Ex.
Maumeri (Flores). Coral Reef; MAX WEBER leg.

The specimen from Stat. 89 has the arms 80 mm. long; there are five or six post-radial axillaries; that from Amboina has the arms 85 mm. long, and five or six post-radial axillaries; the one from Maumeri has the arms 75 mm. long and four or five post-radial axillaries.

2. *Comaster minimus* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, p. 392 (*Phanogenia minima*).

Stat. 37. Sailus ketjil, Paternoster Islands. 27 Metres and less. 2 Ex.
Stat. 302. 10° 27'.9 S., 123° 28'.7 E. 216 Metres. 1 Ex.

I am rather doubtful about the correctness of the determination of the specimen from Stat. 37. It has 16 arms about 40 mm. long; there are two IIBr 4 (3 + 4) series, each of them bearing two IIIBr 2 series; the centrodorsal is a very thin pentagonal disk without cirri, though with obsolete cirrus sockets. Though agreeing well with *C. minimus*, this example does not show the extreme delicacy of build characteristic of that form, and it is possible that it is only a very young specimen of *C. novae-guineae.*

A small specimen with 10 arms 20 mm. long was also secured at Stat. 37; the centrodorsal is much reduced, and bears five cirri which have 8, 9, 10, 12 and 12 segments.

The individual from Stat. 302 has 19 arms about 90 mm. long; three of the IBr series bear a single IIBr 4 (3 + 4) series, each of the latter bearing two IIIBr 2 series. The arms are excessively delicate and attenuated, and greatly elongated, and the pinnules are exceedingly slender and hair-like. The distal ends of the brachials and pinnulars, especially the latter, are exceedingly spinous. The distal pinnules are 9 mm. long. The dorsal interradial perisome is heavily plated, and this plating is continued onto the ventral surface of the disk in the form of deep crescents which extend inward in the interambulacral areas; the plates of the inner portion of these crescents are thickly studded with long sharp spines. The anal tube is completely plated, the plates bearing numerous long spines. The mouth is central, the anal tube subcentral.

3. *Comaster multibrachiata* (P. H. Carpenter).

P. H. CARPENTER. Trans. Linn. Soc. (Zoöl.), series 2, vol. 2, 1879, p. 23, footnote (*Comatula*, sp.).
—— Proc. Roy. Soc., vol. 28, 1879, p. 386 (*Actinometra novae-guineae*).
—— "Challenger" Reports. Comatulae, 1888, p. 299, pl. 56, figs. 3, 4 (*Actinometra multibrachiata*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra regalis*, part).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 204 (*Phanogenia multibrachiata*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 392 (*Phanogenia multibrachiata*).
—— Crinoids of the Indian Ocean, 1912, p. 86.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 13 (*Comaster multibrachiata*, and also *C. fruticosus*).

Stat. 240. Banda. 9—36 Metres. 1 Ex.
Stat. 316. 7° 19′.4 S., 116° 49′.5 E. 538 Metres. 1 Ex.

The specimen from Stat. 316 is typical; there are from 140 to 150 arms; one of the IBr series is 6 (5 + 6); the cirri are XVI, 14—15.

The example from Banda is small and very badly broken.

4. *Comaster fruticosus* A. H. Clark.

A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 204 (*Phanogenia novae-guineae*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 532.
—— Crinoids of the Indian Ocean, 1912, p. 84.

The following citations do not refer to this species:

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 26, 1913, p. 178 *(Comaster fruticosus)* = *Comaster schönovi.*

—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 13 *(Comaster fruticosus)* = *Comaster multibrachiata.*

Stat. 282. Anchorage between Nusa Besi and the northeastern point of Timor. 27—54 Metres. 2 Ex.

The larger specimen has about 60 arms which are about 90 mm. long; the cirri are XXI, 10—11, 8 mm. to 9 mm. long.

The smaller is in the ten armed juvenile stage, the arms being 25 mm. long.

5. *Comaster sibogae* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 21.

Stat. 318. 6° 36'.5 S., 114° 55'.5 E. 88 Metres. 1 Ex.

The cirri are XXII, 13, 13 mm. long; the first segment is short, the second twice as long as its median diameter, the third about three times as long as its median diameter, the fourth and fifth the longest, from three to three and one half times as long as the median diameter; the following segments decrease rapidly in length so that the antepenultimate is slightly longer than broad and the penultimate about as long as broad; the fifth is a transition segment; the following have small, but sharp and prominent, dorsal spines which are acutely triangular in end view; the opposing spine is subterminal, slender, and very sharp, in height equal to about one third the lateral diameter of the penultimate segment; the terminal claw is nearly or quite twice as long as the penultimate segment, very slender and moderately curved basally, but becoming nearly straight in the outer two thirds.

The arms are about 60 in number, 100 mm. long.

The mouth is subcentral and the anal tube submarginal.

The terminal comb on the proximal pinnules has 11 or 12 teeth.

Comaster sibogae is most nearly related to *C. fruticosus*, differing from that species chiefly in its proportionately longer and more slender cirri, which have proportionately longer segments and sharper and more prominent dorsal spines in the distal portion.

6. *Comaster pulcher* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 22.

Stat. 257. In Du-roa Strait, Kei Islands. Up to 52 Metres. 1 Ex.

The cirri are XXVII, 15—17, 12 mm. to 15 mm. long; the first segment is about twice as broad as long, the second about twice as long as the expanded distal ends, strongly constricted centrally, the third from three to four times as long as the median diameter, constricted centrally, though not so much so as the preceding; the fourth segment is slightly over twice as long as the proximal diameter; the following segments rapidly decrease in length so

that the seventh and following are about as long as broad; the fourth and following bear small subterminal dorsal tubercles, and also have the distal edge everted and prominent so that in a lateral view they appear to bear dorsally a broad tubercle with a concave crest.

The 37 arms are 85 mm. long; one of the IIBr series is 2, the remaining nine being 4 (3 + 4); the IIIBr series are all 2; the three which are absent are all external.

The mouth is central, the anal tube submarginal.

7. *Comaster parvus* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 144.
—— Crinoids of the Indian Ocean, 1912, p. 88, fig. 3, p. 88.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 87.

Stat. 240. Banda. 9—36 Metres. 4 Ex.
Stat. 274. 5° 28'.2 S., 134° 53'.9 E. 57 Metres. 1 Ex.
Stat. 294. 10° 12'.2 S., 124° 27'.3 E. 73 Metres 4 Ex.

The specimen from Stat. 274 is young; it possesses 27 arms 55 mm. long and cirri XIII, 10—11, 8 mm. long. It appears to belong to this species and not to *C. distincta* for the reason that the IIIBr series are developed externally as well as internally, both occurring on the same IIBr series; in *C. distincta* external IIIBr series are very exceptional.

The largest individual from Stat. 294 has 41 arms 100 mm. long; the cirri are XXIV, 11—13 (usually 12) 10 mm. long. Of the others, which are very small, one has 11 arms and two 10 arms only.

The largest example from Banda has about 36 arms which are about 75 mm. long; the cirri are 9 mm. long and are composed of 9—10 segments. Of the remainder one has 11 arms 25 mm. long, one 10 arms 45 mm. long, and the last 10 arms 35 mm. long.

8. *Comaster distincta* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 295, pl. 55, fig. 1 (*Actinometra distincta*); p. 338 (*Actinometra parvicirra*, part).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra parvicirra*, part); p. 400 (*Antedon brevicirra*).
A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 533 (differential characters).
—— Crinoids of the Indian Ocean, 1912, p. 87.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 13.

Stat. 65ª. 7° 0' S., 120° 34'.5 E. 120—400 Metres. 2 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 3 Ex.
Stat. 153. 0° 3'.8 N., 130° 24'.3 E. 141 Metres. 1 Ex.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. 90 Metres. 3 Ex.
Stat. 289. 9° 0'.3 S., 126° 24'.5 E. 112 Metres. 3 Ex.
Stat. 294. 10° 12'.2 S., 124° 27'.3 E. 73 Metres. 5 Ex,
Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 8 Ex.

From Stat. 65ª there are two small broken examples.

The largest specimen from Stat. 144 has 21 arms; one ray bears only two, with the

other four regenerating; there are 11 cirrus segments. The other two are 10 armed young with the arms 22 mm. long.

The individual from Stat. 153 has about 34 arms 110 mm. long.

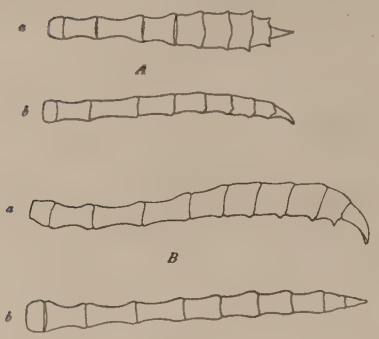

Fig. 2.

Abnormal and normal cirri from a specimen of *Comaster distincta* from Stat. 305.

A a cirrus flattened dorsoventrally, with the dorsal processes doubled and placed laterally, in (*a*) dorsal and in (*b*) lateral view.

B a normal cirrus, laterally flattened, viewed (*a*) laterally and (*b*) dorsally (Courtesy of the U. S. National Museum).

Of the three from Stat. 260 one is large, one small, and one very small with only ten arms.

All of those from Stat. 289 are small; one has 16 arms 35 mm. long; there are three IIBr 4 (3 + 4) series each bearing a IIIBr series of 2 internally; another has 12 arms 25 mm. long; there is a single IIBr 4 (3 + 4) series bearing a IIIBr 2 series internally developed; the third has 10 arms 25 mm. long.

Of the five specimens from Stat. 294 the largest has 15 arms 30 mm. long; there are two IIBr 4 (3 + 4), series, one bearing internally a IIIBr 2 series, the other bearing two IIIBr 2 series; another has 12 arms 25 mm. long; there is a single IIBr 4 (3 + 4) series which bears internally a IIIBr 2 series; a third has 10 arms 25 mm. long, and the remaining two have each 10 arms 15 mm. long.

The largest specimen from Stat. 305 has about 30 arms 75 mm. long; the dorsal pole of the centrodorsal is flat, 2 mm. in diameter; the cirri are XXI, 12—13, 10 mm. long; another has 30 arms 70 mm. long; the cirri are 8 mm. long, composed of 9—10 segments; one of the cirri in this example is curiously modified (Fig. 2, *A*); it is composed of 8 segments and measures 5 mm. in length; the first three segments are of the normal type, but the following are strongly flattened dorsoventrally and greatly broadened, the normal distal dorsal spine occurring at each of the distal angles of the segments. The six additional specimens are all small.

9. *Comaster delicata* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 393 (*Phanogenia delicata*).

Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 Metres. 1 Ex.

This specimen has 20 arms 65 mm. long and the cirri XIII, 14, 8 mm. long; the fifth or sixth (usually the former) is a transition segment.

Except in its smaller size and lesser number of arms this example agrees well with the series from the Philippine Islands in the collection of the U. S. National Museum.

Comantheria A. H. Clark.

Key to the Species of the Genus Comantheria.

a[1] Centrodorsal greatly reduced; cirri absent or rudimentary

b[1] more than 50 arms

c[1] IVBr series 2; following division series 2, except the outermost,

especially on the outer side of each IIIBr series, which are 4 (3 + 4) (Philippine Islands). . . . . *polycnemis*

c² IVBr series 4 (3 + 4)

d¹ VBr series 2; VIBr series, when present, 4 (3 + 4) (northern Australia to the Philippine Islands) . . . . . *alternans*

d² VBr and following series 4 (3 + 4)

e¹ division series narrow and more or less separated (western and northern Australia to the Moluccas and the Philippine Islands) . . . . . *briareus* [1])

e² division series closely united laterally, and the interradial perisome plated (Philippine Islands). . . . . *magnifica*

b² 40 arms (Aru Islands) . . . . . *rotula*

a² Centrodorsal large, bearing numerous long cirri

b¹ cirri slender, in length between one eighth and one fifth of the arm length; the longest proximal segments are from one third to one half again as long as broad; 40 arms

c¹ cirri composed of 19—20 segments of which the longest are about half again as long as broad (Lesser Sunda Islands) . . . *weberi*

c² cirri more slender, with 20—28 (usually 24—26) segments of which the longest are about one third again as long as broad (southern Japan) . . . . . *intermedia*

b² cirri large and robust, their length equal to about one third of the arm length; the longest proximal cirrus segments are about as long as broad; 31—48 arms

c¹ division series broad, nearly or quite in lateral apposition, the component ossicles with smooth distal edges; brachials with the distal edges not noticeably produced; 47—48 arms (coast of China) *grandicalyx*

c² division series narrow, strongly convex dorsally, the component ossicles with everted and spinous distal edges; brachials with strongly produced and spinous overlapping distal edges; cirrals with more or less overlapping distal ends; 31—48 arms (southern Japan from the Korean Straits to Sagami Bay) . . . . . *imbricata*

1. *Comantheria polycnemis* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 396 (*Comanthus polycnemis*).
—— Crinoids of the Indian Ocean, 1912, p. 89.

Stat. 99. 6°7′.5 N., 120°26′ E. 16—23 Metres. 1 Ex.

This individual has 85 arms 130 mm. long.

1) Synonyms: *Actinometra divaricata* P. H. Carpenter; *Comanthus callipeplum* H. L. Clark.

2. *Comantheria briareus* (Bell).

BELL. Proc. Zoöl. Soc. London, 1882, p. 534 (*Antedon briareus*).
—— "Alert" Report, 1884, p. 163, pl. 14 (*Antedon briareus*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 60, N° 10; p. 330 (*Actinometra briareus*); p. 332, pl. 63, figs. 6—8 (*Actinometra divaricata*).
HARTLAUB. Nova Acta der Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 94 (*Actinometra divaricata*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 394 (*Actinometra parvicirra*, part).
KOEHLER. Revue suisse zool., vol. 3, 1895, p. 289 (*Actinometra divaricata*).
—— Mem. soc. zool. France, vol. 8, 1895, p. 421 (*Actinometra divaricata*).
A. H, CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 205 (*Comanthus divaricata*) p. 206 (*Comanthus alternans*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 395 (*Comanthus briareus*); p. 396 (the specimen listed as *Comanthus alternans* in the preceding reference is erroneously referred to *C. polycnemis*).
—— Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 365 (*Comanthus briareus*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 535 (*Comanthus* [*Comanthus*] *briareus*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, pp. 437, 439, 443, 444, 454.
—— Recent Crinoids of Australia, 1911, p. 752.
—— Crinoids of the Indian Ocean, 1912, p. 90.
—— Proc. U. S. National Museum, vol. 43, 1912, p. 390.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 13.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, part 1, p. 87.
H. L. CLARK. Records of the Western Australian Museum, vol. 1, 1914, part. 3, p. 134 (*Comanthus alternans*); p. 135 (*Comanthus polycnemis*).
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 222.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 102 (*Comanthus callipeplum*).

Stat. 33. Bay of Pidjot, Lombok. 22 Metres and less. 1 Ex.
Stat. 50. Bay of Badjo, western coast of Flores. Up to 40 Metres. 4 Ex.
Stat. 60. Haingsisi, Samau Island, Timor. Reef. 1 Ex.
Stat. 96. Southeastern side of the Pearl Bank, Sulu Archipelago. 15 Metres. 1 Ex.
Stat. 125. Anchorage off Sawan, Siau Island. 27 Metres. 1 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 1 Ex.
Stat. 240. Banda 9—36 Metres. 1 Ex.
Stat. 257. In Du-roa Strait, Kei Islands. Up to 52 Metres. 1 Ex.
Stat. 282. 8° 25'.2 S., 127° 18'.4 E. 27—54 Metres. 2 Ex.
Stat. 299. 10° 52'.4 S., 123° 1'.1 E. 34 Metres. 2 Ex.

The specimen from Stat. 33 has about 95 arms which are about 100 mm. long; the colour is a uniform yellow brown.

The largest individual from Stat. 50 has about 120 arms about 110 mm. long; one of the IIBr series is 2; the IIIBr series on the five rays are as follows: (1) four of 2; (2) one of 2 and three of 4 (3 + 4); (3) four of 2; (4) four of 4 (3 + 4), two of these being on the IIBr 2 series; (5) one of 4 (3 + 4) and three of 2; the centrodorsal is very small. A similar example has all the IIBr series 4 (3 + 4); thirteen of the IIIBr series are 2 and seven are 4 (3 + 4); usually the IIIBr series of 4 (3 + 4) occur in pairs on the same IIBr series; the centrodorsal is very small and stellate. Another large specimen has one of the IIIBr series 4 (3 + 4), the other IIIBr series being 2, and all the IIBr series being 4 (3 + 4); the centrodorsal is very

small and stellate, sunk well below the dorsal surface of the radials. The fourth specimen has 37 arms 65 mm. long, and V cirri.

From Stat. 60 (reef) there is a medium sized, but robust and well developed, individual with about 100 arms 110 mm. long; the centrodorsal is small and pentalobate.

The specimen from Stat. 96 has about 80 arms 105 mm. long; the centrodorsal is very small and stellate.

The example from Stat. 125 has about 80 arms about 100 mm. long; only seven of the IIIBr series are 2; adolescent autotomy is in progress; the centrodorsal is irregularly polygonal, though sunk below the level of the dorsal surface of the radials; the colour is dark brown, the radials darker, the centrodorsal nearly white.

The specimen from Stat. 144 has between 90 and 100 arms about 90 mm. long; four of the IIIBr series are 4 (3 + 4); the centrodorsal is very small and stellate; the colour is a uniform yellow brown.

The specimen from Banda is typical, with about 100 arms which are about 120 mm. long.

The example from Stat. 257 has about 50 arms which are about 90 mm. long.

From Stat. 282 there is a typical specimen with about 100 arms, and a small specimen with 26 arms about 70 mm. long undergoing adolescent autotomy; in the latter the arms on the several rays are 2, 1 and 6, 3 and 5, 2, and 6 and 1; the cirri are XVI, 12—13 (usually the latter) 8 mm. long.

Of the examples from Stat. 299 one is a magnificent representative of the species with about 80 arms 155 mm. long; the IIIBr series are all 2, all the other division series being 4 (3 + 4); the other is a slightly smaller individual; both have exceedingly reduced stellate centrodorsals.

The deepness and strong dorsal convexity of the division series of this species, as well as a certain ruggedness in their appearance, make it easily recognizable in spite of any irregularity which may occur in the IIIBr series.

3. *Comantheria rotula* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 23.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 14.

Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 11 Ex.
Stat. 282. 8° 25′.2 S., 127° 18′.4 E. 27—54 Metres. 1 Ex.

This form is intermediate between *C. briareus* and *C. weberi*; it exhibits the post-radial structure of the latter, but possesses the centrodorsal and cirri of the former.

The centrodorsal is greatly reduced, usually with a few weak cirri, though there may be none.

The arms are 40 in number, from 100 mm. to 150 mm. long; the IIBr series are 4 (3 + 4), and the IIIBr series are 2; there is no further division. The dorsal surface of the animal is smooth, with comparatively little overlap to the brachials, and the rugged appearance characteristic of *C. briareus* is entirely absent.

4. *Comantheria weberi* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 22.

Stat. 49a. 8° 23'.5 S., 119° 4'.6 E. 69 Metres. 1 Ex.

The centrodorsal is discoidal, moderately thick, the flat dorsal pole 4 mm. in diameter. The cirri are XXXII, 19—20 (usually the latter) about 20 mm. long; the fifth and sixth or sixth and seventh segments are the longest, about half again as long as broad; the seventh or eighth (usually the latter) is a transition segment, strongly marked, with a dark band; the outer segments are nearly or quite twice as broad as long; the distal dorsal edge of the segments following the transition segment slowly becomes more and more prominent, forming a serrate transverse ridge which on the outer segments becomes subterminal, remaining as a narrow serrate ridge, which may be more or less elevated in the centre; on about the fifth segment following the transition segment a small low tubercle appears midway between this ridge and the proximal end of the segments which on the outer segments becomes pointed, so that in lateral view the dorsal profile of the segments is bidentate, as in *Oligometrides adeonae*; the longer proximal segments are slightly constricted centrally with prominent ends; proximal to the transition segment the cirri are brownish yellow, beyond white and highly polished.

There are exactly forty arms 95 mm. long, all grooved; all the IIBr series are 4 (3 + 4), all the IIIBr series 2; there is no further division. The division series are moderately broad, well rounded dorsally, moderately separated. The dorsal interradial perisome carries small scattered inconspicuous plates.

The brachials are moderately overlapping. Syzygies occur between the third and fourth brachials, again between the 11th and 12th (more rarely 12th and 13th) and 16th and 17th (less commonly 17th and 18th), and distally at intervals of three oblique muscular articulations.

The mouth is submarginal and interradial.

Comantheria weberi is very closely related to *C. intermedia* of southern Japan from which it differs in having somewhat stouter cirri with fewer segments of which the longest are half again as long as broad instead of only slightly longer than broad.

Comanthina A. H. Clark.

1. *Comanthina schlegelii* (P. H. Carpenter).

P. H. CARPENTER. Notes from the Leyden Museum, vol. 3, 1881, p. 210 (*Actinometra schlegelii*).
—— Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 521 (*Actinometra* sp.; Banda).
BELL. "Alert" Report, 1884, p. 169 (*Actinometra multifida*, part).
P. H. CARPENTER "Challenger" Reports. Stalked Crinoids, 1884, p. 110 (*Actinometra dissimilis*).
VON GRAFF. "Challenger" Reports. Myzostoma, 1887, p. 13 (*Actinometra nobilis*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 335, pl. 64, fig. 3 (*Actinometra duplex*); p. 336, pl. 65 (*Actinometra nobilis*); p. 347, pl. 68 (*Actinometra regalis*).
HAMANN. Jenaische Zeitschr., vol. 23, 1889, p. 234 (*Actinometra nobilis*).
CUÉNOT. Archives de biol., vol. 11, 1891, p. 315 (*Actinometra nobilis*).
HARTLAUB. Nova Acta der Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 96 (*Actinometra parvicirra*, part); p. 99 (*Actinometra regalis*).

BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra duplex*).
KOEHLER. Revue suisse zool., vol. 3, 1895, p. 293 (*Actinometra duplex*).
—— Mem. soc. zool. France, vol. 8, 1895, p. 420 (*Actinometra regalis*).
WHEELER. Mittheil. aus d. Stat. Neapel, vol. 12, 1896, p. 224 (*Actinometra nobilis*).
DÖDERLEIN. Denkschr. der medicin.-naturwiss. Gesellsch. Jena, vol. 8, 1898, Heft 5, p. 480 (*Actinometra regalis*).
BELL. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, part 3, p. 225 (*Actinometra typica*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 204 (*Comanthus nobilis*); p. 205 (*Comanthus duplex*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 395 (*Comanthus nobilis*); p. 397 (*Comanthus duplex*).
—— Vidensk. Medd. fra den naturf. Forening i København, 1909, p. 143 (*Comanthus* [*Comanthus*] *nobilis*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 536 (*Comanthus* [*Comanthus*] *schlegelii*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 179.
—— Bull. du mus. d'hist. nat. de Paris, 1911, N° 4, p. 248 (*Comanthina schlegelii*).
—— Memoirs of the Australian Museum, N° 4, 1911, p. 753.
—— Die Fauna südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 439, 443.
—— Records of the Australian Museum, vol. 9, 1912, N° 1. p. 81.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 8.
—— Proc. U. S. National Museum, vol. 43, 1912. p. 391.
—— Crinoids of the Indian Ocean, 1912, p. 91.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, p. 14.
REICHENSPERGER. Abhandl. der Senck. naturf. Gesellsch., vol. 35, Heft 1, 1913, p. 88.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 101 (*Comanthus schlegelii*).

Stat. 33. Bay of Pidjot, Lombok. 22 Metres and less. 2 Ex.
Stat. 99. Anchorage off North Ubian. 16—23 Metres. 1 Ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 Metres. 1 Ex.
Stat. 220. Binongka Island. 55 Metres. 2 Ex.
Stat. 303. Haingsisi, Samau Island. Down to 36 Metres. 1 Ex.
Batavia Bay. 1 Ex.

Both of the specimens from Stat. 33 are large and typical of the species. One has the centrodorsal regularly pentagonal, though as yet not quite sunken to the level of the radial pentagon; the IIBr series on the two posterior rays are 2, on the other three 4 (3 + 4); the IIIBr series on the two posterior rays are 4 (3 + 4)—2—4 (3 + 4)—4 (3 + 4), and all 4 (3 + 4); on one of the other rays one of the outer divisions is 2, the three others 4 (3 + 4); the other two rays are regular; the division series are very broad, almost or quite in lateral apposition; when exposed the interradial perisome is heavily plated; the three anterior rays are dark brown with small blotches of yellowish; the two posterior rays and the bases of the arms which they bear are yellowish white, but the outer part of these arms is dark brown like those on the anterior rays, with more or less light yellow in the median line. The other specimen is typical.

The example from Stat. 99 is large, with about 120 arms which are about 130 mm. long; the centrodorsal is small, pentagonal, sunk to the level of the radials.

The magnificent specimen from Stat. 164 has about 100 arms which are about 150 mm. long; the division series are broad, interiorly united and closely flattened against each other; the adjacent rays and division series are closely flattened against each other as far as the $IIBr_2$

or even the IIBr axillary, beyond which point the perisome is solidly plated; the centrodorsal is very small, concave dorsally, sunken within the radial circlet; on three of the rays the IIIBr series are 2—4 (3 + 4)—4 (3 + 4)—2; on one ray 2—4 (3 + 4)—4 (3 + 4)—4 (3 + 4); and on the fifth 2—2—4 (3 + 4)—4 (3 + 4).

The fine example from Stat. 303 is fully grown, but carries eight more or less rudimentary cirri.

The larger individual from Binongka has 70 arms 120 mm. long; the centrodorsal is very thin, discoidal, with the flat dorsal pole 3.5 mm. in diameter; the cirri are XIV, 14—15, 10 mm. long; the colour is whitish, the division series heavily blotched with dark gray; the outer part of the arms is dark gray; the outer part of the pinnules is brown.

The smaller specimen from Binongka has 62 arm 95 mm. long; it closely resembles the following; there is usually one more division series on the outer branch of the IIIBr series than elsewhere; the arms are less developed and more slender than in the preceding, and the rays and division series are less broad; the centrodorsal is thin-discoidal, with the dorsal pole 3 mm. in diameter; the cirri are XI, with some additional rudimentary, 14—15, 10 mm. to 12 mm. long.

The example from Batavia Bay has about 70 arms 85 mm. long; the rays and division series are comparatively narrow and well separated dorsally; the interradial perisome is heavily plated; the cirri are XIV, with others more or less rudimentary, 14—16, 10 mm. to 12 mm. long; the colour is slaty gray.

Comanthus A. H. Clark.

Key to the Subgenera of the Genus Comanthus.

a¹ Cirri always present, numerous, evenly distributed about the periphery of the centrodorsal, usually stout, compressed distally, except in two species with more than 20 segments; IIBr series almost invariably 4 (3 + 4) . . . . . **Cenolia**

a² Cirri few, small, weak, with the distal segments only slightly shorter than the proximal and only slightly compressed, irregularly distributed about the periphery of the centrodorsal, or absent altogether; one or more of the IIBr series 2 instead of 4 (3 + 4) . . . . . **Vania**

Key to the Species of the Genus Comanthus.

a¹ Cirri present

b¹ cirri entirely without dorsal processes, large, stout, well developed, numerous, composed of 20—30 segments (usually 25—30) of which the outer are usually only slightly shorter than the proximal; centrodorsal very large, hemispherical, with a deeply concave dorsal pole; 60 to 120 (usually more than 70) arms from 130 mm. to 160 mm. in length (Queensland and the Loyalty Islands to the Andaman Islands and Singapore, and northward to the Pelew and Marshall Islands) . . . . *bennetti*

b² outer cirrus segments always with more or less developed dorsal processes, and much shorter than the proximal; less than 60 arms

c¹ cirri very large and stout, long, numerous, composed of more than 32 segments; centrodorsal large, more or less hemispherical, with a relatively small concave dorsal pole; usually about 40 arms, with all the division series 4 (3 + 4); size medium or large, the arm length being between 100 mm. and 200 mm. (commonly between 150 mm. and 200 mm.)

d¹ division series broad, so that only small perisomic areas are visible in dorsal view, and comparatively flat (southern Japan) . . . . . *pinguis*

d² division series narrow and strongly convex, exposing broad areas of perisome (southern Japan and southward to Hong Kong) . *japonica*

c² cirri composed of fewer than 30 (usually fewer than 25) segments, short, or, if elongated, slender; centrodorsal with a broad flat dorsal pole; 13—35 arms

d¹ 18—30 cirrus segments

e¹ cirri all or mostly more or less undeveloped and very variable in size, composed of a very variable number of segments, though always with fewer than 30 and usually with fewer than 25; division series very broad, comparatively flat dorsally and in close apposition so that no perisome is visible in dorsal view; 20—44 arms (southern Japan and southward to Formosa [Taiwan]) . . *solaster*

e² cirri all or nearly all mature, the majority of approximately the same size; number of cirrus segments variable only within narrow limits; division series broad and more or less flattened dorsally, but always with more or less perisome visible between them; 20—35 arms

f¹ cirri shorter and more slender, with about 20 segments; 20—35 arms (southern Australia and Tasmania) . . . . . *trichoptera*

f² cirri longer and slightly stouter, with 24—27 (usually 26—27) segments (New Zealand). . . . . *benhami*

d² not more than 17 cirrus segments

e¹ cirri, though small, strong and well developed, with the outer portion strongly recurved, distributed evenly about the periphery of the centrodorsal; usually all the division series 4 (3 + 4); 13—21 arms

f¹ slender and delicate, with 15—21 slender slowly tapering arms 50 mm. to 70 mm. long (northern Australia to the Bay of Bengal, the Philippine Islands, the Caroline Islands, Tonga, Samoa, Fiji, and New Caledonia) . *samoana*

f² stout and robust, with 13—21 (usually 16—20) short, stout and rapidly tapering arms usually about 60 mm. long (Cape of Good Hope). . . . . *wahlbergii*

e² cirri short, weak, and poorly developed, irregularly distributed about

the periphery of the centrodorsal; outer portion of the cirri nearly straight; usually one or more of the IIBr series 2 instead of 4 (3 + 4); 20—60 arms

f¹ usually 35—60 arms (Ceylon and the Bay of Bengal to western and northern Australia, the Solomon Islands, Fiji and Tonga, and northward to the Philippines). . . . . *annulata*

f² usually 20—30 arms (Seychelles, Madagascar and the Mascarene Islands to Ceylon and the Bay of Bengal, and eastward to western and northern Australia, New Caledonia, Samoa, Tonga, the Friendly, Pelew and Caroline Islands, and northward to southern Japan and Amoy, China). . . . . *parvicirra*

a² Cirri absent

b¹ usually between 35 and 60 arms, which are more than 100 mm. long (Ceylon and the Bay of Bengal to western and northern Australia, the Solomon Islands, Fiji and Tonga, and northward to the Philippines). . . . . *annulata*

b² usually between 20 and 30 arms, which are rarely more than 100 mm. long (Seychelles, Madagascar and the Mascarene Islands to Ceylon and the Bay of Bengal, and eastward to western and northern Australia, New Caledonia, Samoa, Tonga, the Friendly, Pelew and Caroline Islands, and northward to southern Japan and Amoy, China) . . . . . *parvicirra*

1. *Comanthus* (*Cenolia*) *bennetti* (J. Müller).

LAMARCK. Hist. nat. des animaux sans vertèbres, vol. 2, 1816, p. 533 (*Comatula multiradiata*, part).
GOLDFUSS. Petrefacta Germaniae, vol. 1, 1832, p. 202, pl. 61, fig. 2, *a—s* (*Comatula multiradiata*).
J. MÜLLER. Archiv für Naturgesch., 1841, I, p. 146 (*Alecto bennetti*).
—— Abhandl. d. k. preuss. Akad. d. Wiss., 1841 (1843), p. 216 (*Alecto bennetti*).
—— Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 261 (*Comatula* [*Alecto*] *multiradiata*, part); p. 264 (*Comatula bennetti*).
DUJARDIN et HUPÉ. Hist. nat. des zoophytes. Échinodermes, p. 208 (*Comatula bennetti*); p. 210 (*Actinometra multiradiata*, part); p. 212 (*Comaster multiradiatus*).
BÖHLSCHE. Archiv für Naturgesch., 1866, I, p. 90 (*Actinometra bennetti*).
LUDWIG. Zeitschr. für wiss. Zool., vol. 28, 1877, p. 255 (*Actinometra bennetti*).
LÜTKEN. Cat. Mus. Godeffroy, vol. 5, 1877, p. 100 (*Actinometra brachymera*).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 13, 1877, p. 450 (*Actinometra bennetti*).
—— Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1879, p. 27 (*Actinometra bennetti*).
—— Notes from the Leyden Museum, vol. 3, 1881, p. 212 (*Actinometra bennetti*); p. 214 (*Actinometra peronii*).
—— Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, pp. 521, 523, 526 (*Actinometra bennetti*).
VON GRAFF. "Challenger" Reports. Myzostoma, 1887, pp. 5, 7, 11 (*Actinometra bennetti*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, pp. 59, 61, 329, 331, 348, 366 (*Actinometra bennetti*); pp. 59, 324, 331, 348, 367, 386 (*Actinometra peroni*).

HARTLAUB. Nova Acta der Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 95 (*Actinometra bennetti*).
NORMAN. Ann. and Mag. Nat. Hist., (6), vol. 7, 1891, p. 387 (*Actinometra peronii*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra bennetti*).
KOEHLER. Revue suisse zool., vol. 3, 1895, p. 290 (*Actinometra robustipinna*).
BELL. Willey's Zoölogical Results, part 2, 1899, p. 134 (*Actinometra bennetti* and *Act. grandicalix*).
A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 147 (*Comanthus* [*Comanthus*] *bennetti*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 180 (*Comanthus bennetti*).
—— Bull. du mus. d'hist. nat. de Paris, 1911, N° 4, p. 248 (*Comanthus bennetti*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 439, 443 (*Comanthus bennetti*).
—— Memoirs of the Australian Museum, vol. 4, 1911, part 15, p. 754 (*Comanthus* [*Bennettia*] *bennetti*).
—— Proc. U. S. National Museum, vol. 43, 1912, p. 391 (*Comanthus bennetti*).
—— Crinoids of the Indian Ocean, 1912, p. 93 (*Comanthus bennetti*).
—— Proc. Biol. Soc. Washington, vol. 25, 1912, p. 23 (*Comanthus crassicirra*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 8 (*Comanthus bennetti*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 15 (*Comanthus bennetti*).

Stat. 133. Anchorage off Lirung, Salibabu Island. Down to 36 Metres. 1 Ex.
Stat. 240. Banda. 9—36 Metres. 1 Ex.
Stat. 299. Buka or Cyrus Bay, southern coast of Rotti Island. Down to 34 Metres. 1 Ex.

The small specimen from Stat. 133 I at first considered as representing a new species related to *C. japonica*. It is evidently very immature, for the irregularity in the numbers of the arms on the different rays indicate that it is undergoing adolescent autotomy. The earlier cirri have slight dorsal processes, and this led me to consider it near *C. japonica*; but the later cirri appear to be quite without them. In very young *C. japonica* the young cirri possess very strong dorsal processes.

The centrodorsal is flattened-hemispherical, small, with a flat dorsal pole 2 mm. in diameter; the cirrus sockets are arranged in one and a partial second irregular marginal rows.

The cirri are XVII, 17—24, 15 mm. to 24 mm. long, large and stout; the first segment is short, the following increasing in length to the fourth, which is nearly or quite as long as broad, and still further increasing to the fifth and sixth or sixth and seventh which are the longest, nearly or quite half again as long as broad; the following gradually decrease in length so that the last eight or ten are slightly broader than long; on the fully developed cirri (which are evidently not of the type which the animal will possess when adult) the twelfth or thirteenth and following segments have small subterminal dorsal tubercles; the shorter distal segments are slightly compressed laterally and have a polished surface, though this begins gradually without a transition segment; the opposing spine is small, low and broad, median or subterminal.

Deep but very narrow subradial clefts are present.

The mouth is interradial and submarginal; the anal tube is central.

The radials are just visible beyond the edge of the centrodorsal, extending well up in the angles of the calyx; they are slightly separated distally, so that the bases of the IBr_1 are rather widely separated. The IBr_1 are short, with a convex proximal border and slightly converging sides; they are about three times as broad as the median length. The IBr_2 (axillaries) are broadly

pentagonal, twice as broad as long, the anterior angle sharp, the anterior sides concave, the lateral edges about as long as those of the IBr_1 with which they make an obtuse angle.

The seventeen arms are 120 mm. long; all the division series are 4 (3 + 4); there are three IIBr series and four IIIBr series, three of which are internal, the fourth external at the side of one of the preceding. The division series are narrow so that a large amount of perisome is visible in dorsal view; this is protected by numerous irregular calcareous plates.

P_1 is 20 mm. long, stout basally and tapering rapidly in the proximal third, more gradually from that point onward, with 38 segments; the terminal comb is borne on the last fourteen segments and is composed of low rounded teeth which become obsolete on the three terminal segments. P_2 is much shorter than P_1 and proportionately less stout, though similar; it possesses 28 segments and is 10 mm. long; the comb consists of nine teeth of which the first three are small; there are no teeth on the three or four terminal segments. P_3 is small and slender, 7 mm. long with 23 segments. P_4 is slightly smaller and more slender than P_3, 6 mm. long, with only a rudimentary comb. P_5 is 5.5 mm. long composed of 17 segments, without a comb; it is very slightly stouter than the two preceding pinnules and tapers more evenly to the very delicate tip. The following pinnules are similar. The distal pinnules are very slender, 8 mm. long with 17 segments,

The colour is grayish brown, the cirri yellowish.

The specimen from Stat. 299 is a magnificent typical example of the species with about 120 arms 180 mm. long; the cirri are about XL, 26—28, 35 mm. to 40 mm. long, typically stout and smooth; all of the arms are grooved.

The individual from Banda is similar with about 80 arms which are about 180 mm. long; the cirri are XXI, 27—32, 35 mm. to 45 mm. long; one of the IIIBr series is 1, and two are 2; all the other division series are 4 (3 + 4).

2. *Comanthus* (*Cenolia*) *samoana* A. H. Clark.

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 338 (*Actinometra parvicirra*, part).
A. H. CLARK. Proc. U. S. National Museum, vol. 37, 1909, p. 30 (*Comanthus* [*Comanthus*] *samoana*).
—— Bull. du mus. d'hist. nat. de Paris, 1911, N° 4, p. 248.
—— Records of the Australian Museum, vol. 9, 1912, N° 1, p. 82 (*Comanthus* [*Bennettia*] *samoana*).
—— Crinoids of the Indian Ocean, 1912, p. 95.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 9.
—— Proc. U. S. National Museum, vol. 43, 1912, p. 391.
—— Smithsonian Miscellaneous Collections, vol. 61, 1912, N° 15, p. 17.
—— Die Fauna Südwest-Australiens, vol. 4, 1913, Lief. 6, p. 309.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 103 (*Comanthus samoanum*).

Stat. 50. Bay of Badjo, western coast of Flores. Down to 40 Metres. 1 Ex.
Stat. 162. Between Loslos and Broken Islands, western coast of Salawatti. 18 Metres. 1 Ex.
Stat. 299. Buka or Cyrus Bay, southern coast of Rotti Island. 34 Metres. 1 Ex.

The specimen from Stat. 50 has 20 arms 80 mm. long; all the IIBr series are present, all 4 (3 + 4).

That from Stat. 162 is small with 13 arms about 40 mm. long, and is undergoing adolescent autotomy.

The example from Stat. 299 has 20 arms 65 mm. long; all the IIBr series are present, and all are 4 (3 + 4); the cirri are XVII, slightly more slender than usual.

3. *Comanthus* (*Vania*) *annulata* (Bell).

LÜTKEN. Cat. Mus. Godeffroy, vol. 5, 1874, p. 190 (*Actinometra intricata*, part).
BELL. Proc. Zoöl. Soc. London, 1882, p. 535, pl. 35 (*Actinometra annulata*).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 525 (*Actinometra meyeri*).
BELL. Sci. Trans. Roy. Dublin Soc. (2), vol. 3, 1887, p. 645 (*Actinometra parvicirra*, part).
—— Proc. Zoöl. Soc. London, 1888, p. 384 (*Actinometra parvicirra*, part).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 314, pl. 59, fig. 3 (*Actinometra valida*); p. 338 (*Actinometra parvicirra*, part); p. 346, pl. 67, figs. 1, 2 (*Actinometra littoralis*).
HAMANN. Jenaische Zeitschr., vol. 23, 1889, p. 234 (*Actinometra valida*).
HARTLAUB. Nova Acta der Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 98 (*Actinometra parvicirra*, part).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Actinometra parvicirra*, part).
THURSTON. Madras Government Museum Bulletin, N° 1, 1894, p. 28 (*Actinometra parvicirra*, part).
PFEFFER. Senck. Ges. Abhandl., vol. 25, 1900, p. 85 (*Actinometra litoralis*).
CHADWICK. in Herdman, Report Ceylon Pearl Oyster Fisheries, part 2, 1904, Suppl. Rep. XI, p. 158 (*Actinometra parvicirra*, part).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 220 (*Comanthus intricata*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 143 (*Comanthus* [*Comanthus*] *valida*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, p. 457.
—— Memoirs of the Australian Museum, vol. 4, 1911, part 15, p. 757.
—— Proc. U. S. National Museum, vol. 39, 1911, p. 536.
—— Records of the Australian Museum, vol. 9, 1912, p. N° 1, p. 82.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 9.
—— Proc. U. S. National Museum, vol. 43, 1912, p. 392.
—— Crinoids of the Indian Ocean, 1912, p. 96.
—— Die Fauna Südwest-Australiens, vol. 4, 1913, Lief. 6, p. 309.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 17.
—— Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 120 (*Comanthus* [*Vania*] *annulata*).
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 101 (*Comanthus annulatum*); p. 102 (*Comanthus annulatum xanthum*).

Stat. 43. Anchorage off Pulu Sarassa, Postillon Islands. Down to 36 Metres. 1 Ex.
Stat. 50. Bay of Badjo, western coast of Flores. Down to 40 Metres. 1 Ex.
Stat. 89. Pulu Kaniungan ketjil. 11 Metres. 17 Ex.
Stat. 149. Fau anchorage and lagoon, western coast of Gebé Island. 31 Metres. 1 Ex.
Stat. 209. Anchorage off the south point of Kabaëna Island. Reef 1 Ex.
Stat. 213. Saleyer. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 1 Ex.
Stat. 322. One and one half miles south of Tandjong Lajar, south coast of Bawean Island. 32 Metres. 2 Ex.

The example from Stat. 43 has 40 arms which are about 100 mm. long; all the division series are 4 (3 + 4); the centrodorsal is pentagonal, sunken nearly to the level of the dorsal surface of the radial pentagon, with a few obsolete cirrus sockets on the margin.

The specimen from Stat. 50 has 39 arms 120 mm. long; all the division series are

4 (3 + 4); the centrodorsal is pentagonal, very slightly raised above the surface of the radials; a single slender cirrus, 10 mm. long with 14 segments, remains.

Of the 17 specimens from Stat. 89 the largest has 39 arms 111 mm. long anteriorly, 70 mm. long posteriorly; all the division series are 4 (3 + 4); an external IIIBr series is missing; the centrodorsal is small, with the dorsal pole 1.5 mm. in diameter; the cirri are XII, 15, 9 mm. long, somewhat compressed distally. Another has 28 arms the anterior 120 mm. and the posterior 55 mm. in length; the former are excessively attenuated; the cirri are XII, very small and weak, 6 mm. to 7 mm. long with 12—13 segments. A third has 28 arms, the anterior 90 mm. the posterior 55 mm. in length; of the IIBr series nine are 2, the remaining one being 4 (3 + 4); all of the other division series are 4 (3 + 4); the cirri are X, with some additional rudimentary, compressed distally, 8 mm. to 9 mm. long. A fourth has 22 arms 130 mm. long, very attenuated; five of the IIBr series are 2, and five are 4 (3 + 4); the other division series are all 4 (3 + 4); although the arms are much longer, the calyx is the same size as in the preceding; there are X interradial cirri, 8 mm. long, slender, with 12 segments. Of the remainder three have exactly 40 arms, all the IIIBr series being present, four others have 37, 33, 32 and 25 arms respectively, five are small, and one is an 11-armed young.

The individual from Stat. 149 has 36 arms 110 mm. long; all the IIBr series are 2; one of the IIIBr series is 2, the others 4 (3 + 4); the centrodorsal is greatly reduced, pentalobate, bearing at the tip of one of the lobes a single cirrus 9 mm. long with 14 segments.

The example from the reef at Stat. 209 has 42 arms 95 mm. long; five of the IIBr series are 2; there are VII cirri.

That from Stat. 273 has 36 arms 100 mm. long; there are two small cirri and several stumps.

The larger specimen from Stat. 322 has 49 arms 130 mm. long; all of the IIIBr series are present; of the IIBr series six are 2 and four are 4 (3 + 4), the latter all on two rays; the centrodorsal is greatly reduced, small and sharply stellate; the rays and division series are broad, and are in close lateral apposition and sharply flattened against each other; the smaller has three of the rays undergoing adolescent autotomy; one partially developed cirrus remains on an irregularly pentagonal centrodorsal.

The example from Saleyer has 40 arms 80 mm. long; one IVBr series is present, and one IIIBr series is lacking; all the division series are 4 (3 + 4); there are V cirri, and several small stumps.

4. *Comanthus* (*Vania*) *parvicirra* (J. Müller).

J. MÜLLER. Monatsber. d. k. preuss. Akad. d. Wiss., 1841, p. 185 (*Alecto parvicirra*); p. 186 (*Alecto timorensis*).

—— Archiv für Naturgesch., 1841, I, p. 145 (*Alecto parvicirra* and *A. timorensis*).

—— Abhandl. d. k. preuss. Akad. d. Wiss., 1841, (1843), p. 216 (*Alecto parvicirra* and *A. timorensis*).

—— Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 260 (*Comatula* [*Alecto*] *parvicirra*); p. 263 (*Comatula timorensis*).

DUJARDIN et HUPÉ. Hist. nat. des zoophytes. Échinodermes, 1862, p. 206 (*Comatula timorensis* and *C. parvicirra*); p. 208 (*C. brevicirra*).

LÜTKEN. Cat. Mus. Godeffroy, vol. 4, 1869, p. 125 (*Actinometra trachygaster*, part).

LÜTKEN. Cat. Mus. Godeffroy, vol. 5, 1874, p. 190 (*Actinometra trachygaster*, part, and *Act. intricata*, part).
GRUBE. Jahresber. der schles. Ges. für vaterl. Cultur, 1875, p. 74 (*Comatula mertensi*).
W. B. CARPENTER. Proc. Roy. Soc., vol. 24, 1876, p. 451 (*Actinometra armata*).
P. H. CARPENTER. Journ. Anat. and Physiol., vol. 10, 1876, p. 574 (*Actinometra armata*); pp. 574, 582; vol. 11 p. 89, fig. 1, p. 91 (*Actinometra* [*Comatula*] *armata*).
—— Journ. Linn Soc. (Zoöl.), vol. 13, 1877, p. 441 (*Comatula polymorpha*); p. 443 (*Actinometra polymorpha*).
LUDWIG. Zeitschr. für wiss. Zool., vol. 28, 1877, p. 255 (*Actinometra trachygaster*).
LÜTKEN. Cat. Mus. Godeffroy, vol. 5, 1877, p. 100 (*Actinometra trachygaster*, part, and *Actinometra intricata*, part).
VON GRAFF. Das Genus Myzostoma, 1877, pp. 12, 13, 19, 22, 72, 79 (*Actinometra armata*).
P. H. CARPENTER. Quart. Journ. Micros. Sci., vol. 18, 1878, p. 355 (*Actinometra polymorpha*).
—— Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1879, p. 1 (*Actinometra polymorpha*); p. 27 (*Actinometra parvicirra*); p. 29 (*Comatula timorensis*).
—— Nature, vol. 19, 1879, p. 450 (*Actinometra polymorpha*).
LUDWIG. Morphol. Studien an Echinodermen, 1879, p. 1 (*Actinometra trachygaster*).
P. H. CARPENTER. Popular Science Review, vol. 4, 1880, N° 15, pl. 6, figs. 1, 2 (*Actinometra* sp.).
—— Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, p. 161 (*Actinometra polymorpha*); p. 169 (*Actinometra* sp.).
—— Notes from the Leyden Museum, vol. 3, 1881, p. 204 (*Actinometra parvicirra*); p. 205 (*Comatula brevicirra* and *C. simplex*).
—— Quart. Journ. Micros. Sci, vol. 21, 1881, p. 185 (*Actinometra polymorpha*).
BELL. Proc. Zoöl. Soc. London, 1882, p. 533 (*Antedon mertensi*).
P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 519 (*Actinometra parvicirra*).
BELL. "Alert" Report, 1884, p. 167 (*Actinometra cumingii*); p. 168 (*Actinometra parvicirra*).
P. H. CARPENTER. "Challenger" Reports. Stalked Crinoids, 1884, p. 50, 52, 57, 67, 102, 103, 107, 120, 121, 124, 133, 283, 337, pl. 61, figs. 2—5 (*Actinometra parvicirra*).
VON GRAFF. "Challenger" Reports. Myzostoma, 1884, pp. 14, 19 (*Actinometra intricata*, part); pp. 13, 14, 16, 20 (*Actinometra parvicirra*); pp. 13, 14, 20 (*Actinometra mutabilis*).
P. H. CARPENTER. Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1886, p. 475 (*Actinometra parvicirra*).
PERRIER. Nouv. Archives du mus. d'hist. nat. de Paris, (2), vol. 9, 1886, p. 98 (*Actinometra armata*); p. 116 (*Actinometra trachygaster*, part); p. 134 (*Actinometra polymorpha*); p. 153 (*Actinometra parvicirra*).
P. H. CARPENTER. Quart. Journ. Micros. Sci., vol. 27, 1887, p. 389 (*Actinometra armata*).
—— Ann. and Mag. Nat. Hist., (5), vol. 19, 1887, p. 39 (*Actinometra parvicirra*).
BELL. Sci. Trans. Roy. Dublin Soc., (2), vol. 3, 1887, p. 645 (*Actinometra parvicirra*, part, and *Act. cumingii*; in synonymy, *Act. annotea*).
VON GRAFF. "Challenger" Reports. Myzostoma, 1887, p. 10 (*Actinometra parvicirra*).
BRAUN. Centralbl. für Bakteriol.- und Parasitenkunde, vol. 3, 1888, p. 185 (*Actinometra intricata*, *Act. mutabilis* and *Act. armata*).
BELL. Proc. Zoöl. Soc. London, 1888, pp. 384, 387 (*Actinometra parvicirra*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 311, pl. 17, figs. 2—4 (*Actinometra elongata*); p. 312, pl. 59, fig. 1 (*Actinometra simplex*); p. 313, pl. 59, fig. 2 (*Actinometra rotalaria*); p. 331, pl. 62, fig. 1 (*Actinometra quadrata*); p. 338, pl. 67, figs. 3, 4 (*Actinometra parvicirra*).
HAMANN. Jenaische Zeitschr., vol. 23, 1889, p. 234 (*Actinometra parvicirra*).
HARTLAUB. Nova Acta der Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 96 (*Actinometra parvicirra*; in synonymy *Act. intricata*, *Act. guttata* and *Act. trachygaster*, Lütken, MS.).
BELL. Proc. Zoöl. Soc. London, 1894, pp. 394, 396 (*Actinometra variabilis* and *Act. parvicirra*); p. 396 (*Actinometra rotalaria*).
THURSTON. Madras Government Museum Bulletin, N° 2, 1894, pp. 106, 114 (*Actinometra parvicirra*); p. 117 (*Actinometra cumingi*).

KOEHLER. Revue zool. suisse, vol. 3, 1895, p. 289 (*Actinometra parvicirra*).
DÖDERLEIN. Denkschr. d. medicin.-naturwiss. Ges. Jena, vol. 8, 1898, Heft 5, p. 479, pl. 36, figs. 5, 5*a* (*Actinometra parvicirra*).
BELL. Willey's Zoölogical Results, vol. 2, 1899, p. 134 (*Actinometra parvicirra*).
PFEFFER. Abhandl. der Senck. naturwiss. Ges., vol. 25, 1900, p. 85 (*Actinometra parvicirra* and *Act. elongata*).
SPRINGER. Mem. Mus. Comp. Zoöl., vol. 25, 1901, N° 1, p. 88 (*Actinometra parvicurva*).
CHADWICK. in Herdman, Ceylon Pearl Oyster Report, vol. 2, 1904, p. 158 (*Actinometra parvicirra*, part).
MINCKERT. Archiv für Naturgesch., vol. 71, 1905, Heft 1, p. 226 (*Actinometra quadrata*).
A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 155 (*Comatula orientalis*).
REICHENSPERGER. Zool. Anzeiger, vol. 33, 1908, p. 363 (*Actinometra parvicirra*).
A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 440 (*Comatula helianthus*).
—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 205 (*Comanthus rotalaria*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 397 (*Comanthus rotalaria*).
—— Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 365 (*Comanthus rotalaria*).
—— Vidensk. Med. fra den naturhist. Forening i København, 1909, p. 144 (*Comanthus* [*Comanthus*] *rotalaria*).
—— Bull. du mus. d'hist. nat. de Paris, 1911, N° 4, p. 249 (*Comanthus parvicirra*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 536 (*Comanthus* [*Comanthus*] *parvicirra*).
—— Proc. U. S. National Museum, vol. 40, 1911, p. 18 (*Comanthus* [*Validia*] *parvicirra*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 181 (*Comanthus parvicirra*).
—— Memoirs of the Australian Museum, vol. 4, 1911, part 15, p. 758 (*Comanthus* [*Vania*] *parvicirra*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 439, 443, 444 (*Comanthus parvicirra*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 10 (*Comanthus parvicirra*).
—— Proc. U. S. National Museum, vol. 43, 1912, p. 392 (*Comanthus parvicirra*).
—— Crinoids of the Indian Ocean, 1912, p. 97 (*Comanthus parvicirra*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 18 (*Comanthus parvicirra*).
—— Proc. Biol. Soc. Washington, vol. 26, 1913, p. 178 (*Comanthus parvicirra*).
REICHENSPERGER. Abhandl. der Senk. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 88 (*Comanthus parvicirra*).
A. H. CLARK. Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 121 (*Comanthus* [*Vania*] *parvicirra*).
H. L. CLARK. Records of the Western Australian Museum, vol. 1, 1914, part 3, p. 134 (*Comanthus parvicirra*).
—— Carnegie Institution of Washington Publication N° 212, 1915, p. 102 (*Comanthus luteofuscum*); p. 103 (*Comanthus parvicirrum*).

Stat. 40. Anchorage off Pulu Kawassang, Paternoster Islands. Coral Reef. 2 Ex.
Stat. 43. Anchorage off Pulu Sarassa, Postillon Islands. Down to 36 Metres. 1 Ex.
Stat. 58. Anchorage off Seba, Savu. Reef. 1 Ex.
Stat. 60. Haingsisi, Samau Island, Timor. Reef. 13 Ex.
Stat. 78. Lumu Lumu shoal, Borneo Bank. 34 Metres. 15 Ex.
Stat. 79b. Pulu Kabala-dua, Borneo Bank. 28 Ex.
Stat. 81. Pulu Sebangkatan, Borneo Bank. Reef. 1 Ex.
Stat. 96. South side of Pearl Bank, Sulu Archipelago. 15 Metres. 7 Ex.
Stat. 96. South side of Pearl Bank, Sulu Archipelago. Plankton. 1 Ex.
Stat. 99. Anchorage off North Ubian. 16—23 Metres. 21 Ex.
Stat. 99. Anchorage off North Ubian. Surface. 1 Ex.
Stat. 131. Anchorage off Beo, Karakelang Islands. 13 Metres. 1 Ex.
Stat. 131. Anchorage off Beo, Karakelang Islands. Reef 1 Ex.

Stat. 133. Anchorage off Lirung, Salibabu Island. 36 Metres. 2 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. Reef. 3 Ex.
Stat. 162. Between Loslos and Broken Islands, western coast of Salawatti. 18 Metres. 1 Ex.
Stat. 172. Gisser; anchorage between Gisser and Ceram Laut. 18 Metres. 1 Ex.
Stat. 234. Nalahia Bay, Nusa Laut Island. 46 Metres. 1 Ex.
Stat. 240. Banda. Reef. 1 Ex.
Stat. 240. Banda. 9—36 Metres. 2 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 1 Ex.
Stat. 282. Anchorage between Nusa Besi and the northeastern point of Timor. 27—54 Metres. 6 Ex.
Stat. 294. 10° 12'.2 S., 124° 27'.3 E. Off Timor 73 Metres. 3 Ex.
Stat. 303. Haingsisi. Reef. 1 Ex.
Stat. 310. 8° 30' S., 119° 7'.5 E. 73 Metres. 1 Ex.
Stat. 315. Anchorage east of Sailus Besar, Paternoster Islands. Down to 36 Metres. 1 Ex.
Maumeri. Coral Reef. 2 Ex.

The details of the specimens collected are as follows:

Stat. 40: one has 21 arms 70 mm. long; nine of the IIBr series are 2 and one is 4 (3 + 4); there is a single IIIBr series, internally developed; the other, which is similar, also has 21 arms; all of the IIBr series are 2; as in the preceding the single IIIBr series is 4 (3 + 4).

Stat. 43: a small example with 17 arms and V cirri.

Stat. 58: a small individual with 14 arms.

Stat. 60: All the specimens are of about the same size — medium sized — with the cirri irregular in occurrence, though present in all, slender and weak; (1) 22 arms 80 mm. long; two IIIBr series on a single IIBr series; one cirrus 6 mm. long with 11 segments; (2) 21 arms; five rudimentary cirri on a semicircumference of the centrodorsal; (3) 20 arms; X cirri 6 mm. long; (4) 19 arms; one IIIBr series; V cirri; (5) 19 arms; no IIIBr series; one cirrus; (6) 17 arms; VI cirri 5 mm. long; (7) 17 arms; IV cirri; (8) 17 arms; IV cirri; (9) 19 arms; one IIBr series lacking; IX cirri; (10) 16 arms, one ray with two IIBr series; V cirri; (11) 15 arms; IX cirri; (12) 15 arms; VII cirri; (13) 14 arms, two rays with two IIBr series each; IV. cirri.

Stat. 78: these specimens are characterized by a slender habitus, few, small and weak cirri, strongly marked "dryness", and a tendency to break at the articulation between the elements of the IBr series. (1) 20 arms 60 mm. long; two IIBr series 2, eight 4 (3 + 4); IV small cirri; (2) 18 arms 65 mm. long; two IIBr series 2, six 4 (3 + 4); I cirrus; (3) 18 arms 45 mm. long; eight IIBr 4 (3 + 4) series; III cirri; (4) 17 arms 60 mm. long; four IIBr 2 series, three IIBr 4 (3 + 4) series; IV small cirri 4.5 mm. long; (5) 13 arms 55 mm. long; two IIBr 2 series, and one IIBr 4 (3 + 4) series; III small cirri; the remaining ten specimens are similar to these.

Stat. 79b: In all of the following the cirri are small and weak, irregular in distribution. (1) arms 70 mm. long; (2) 20 arms and VI cirri; (3) 18 arms, one ray without IIBr series, 65 mm. long; V cirri; (4) 18 arms 60 mm. long; IV cirri; (5) 16 arms 55 mm. long; one small cirrus stump; (6) 16 arms 55 mm. long; VI cirri; (7) 15 arms 60 mm. long; no cirri; (8) 15 arms 60 mm. long; V cirri; (9) 14 arms 55 mm. long; one small cirrus stump; (10)

14 arms 60 mm. long; four rudimentary cirri; (11) 14 arms 60 mm. long; V cirri; (12) 15 arms 60 mm. long; one rudimentary cirrus; (13) 12 arms 50 mm. long; I cirrus; (14) 11 arms 55 mm. long; I cirrus; (15) 11 arms 30 mm. long; III cirri; (16) 10 arms 50 mm. long; VII cirri; (17) 10 arms 45 mm. long; IV cirri. The remaining specimens are similar.

Stat. 81: small, with 16 arms 70 mm. long.

Stat. 96: (1) 25 arms 45 mm. long; five of the IIBr series (on three rays) are 2, and five are 4 (3 + 4); on one ray two IIBr 2 series each bear two IIIBr series; there are IV small weak cirri; (2) 22 arms 65 mm. long; there are three IIBr 2 series, all the other division series being 4 (3 + 4); there are V small weak cirri 4 mm. long; (3) 20 arms 70 mm. long; all the IIBr series present, all 4 (3 + 4); (4) 14 arms 25 mm. long; (5) 12 arms 30 mm. long; (6) 13 arms 30 mm. long; (7) 10 arms 17 mm. long.

Stat. 96, plankton: Evidently this specimen was taken in the tow-net, along with normally free swimming organisms. It is a young example in the ten-armed stage, with arms 17 mm. long. Another, smaller, ten-armed example was captured at the surface at Stat. 99. The only other instance of the capture of a crinoid swimming at the surface was of a young *Dorometra nana*, which was attracted by a submerged electric light.

Stat. 99: (1) 28 arms 70 mm. long; V cirri; all the division series are 4 (3 + 4); (2) 23 arm; there are ten IIBr series and three IIIBr series; of the latter two are external and one is internal; all the division series are 4 (3 + 4); there are VI cirri; (3) 20 arms; (4) 19 arms; (5) 13 arms; (6) four with 12 arms 20 mm. to 35 mm. long; (7) three with 11 arms 20 mm. to 30 mm. long; one of these is undergoing adolescent autotomy; (8) nine specimens with 10 arms varying from 13 mm. to 20 mm. in length; the lower pinnules are more or less deficient.

Stat. 99, surface: One very small 10 armed example.

Stat. 131: 20 arms about 90 mm. long; four of the IIBr series are 2 and six are 4 (3 + 4); there are III cirri.

Stat. 131, reef: 21 arms 100 mm. long; ten IIBr series and one IIIBr series, all 4 (3 + 4), are present.

Stat. 133: (1) 28 arms; (2) 12 arms 50 mm. long.

Stat. 144, reef: (1) 12 arms 70 mm. long; both of the IIBr series are 4 (3 + 4); there are IV small cirri; (2) two ten armed specimens, one of the same size as the preceding, the other small.

Stat. 162: medium sized with 14 arms.

Stat. 172: 10 arms 16 mm. long.

Stat. 234: 19 arms 55 mm. long; there are nine IIBr 4 (3 + 4) series.

Stat. 273: small, with 10 arms; the large perisomic interradials of the young persist just above the radials in the interradial angles.

Stat. 282: 22 arms, arranged on the five rays 1 + 2—4 + 1—4 + 4—1 + 3—2; all the division series are 4 (3 + 4); the cirri are very short, but slightly more robust than usual, tending toward the type characteristic of *C. samoana*, V in number. There are in addition five small specimens.

Stat. 294: Three small specimens, one with 12, two with 11 arms.

Stat. 310: Small, with 13 arms, undergoing adolescent autotomy; there is a single IIBr 2 series bearing two IIIBr 4 (3 + 4) series.

Stat. 315: 15 arms 30 mm. long; three of the IIBr series are 2 and two are 4 (3 + 4).

Banda, reef: small, with 11 arms.

Banda, 9—36 Metres: (1) 14 arms about 40 mm. long; (2) 12 arms about 40 mm. long, undergoing adolescent autotomy.

Maumeri: (1) 21 arms 80 mm. long; three of the IIBr series are 2, all the other division series being 4 (3 + 4); the single IIIBr series is externally developed; the cirri are XIV, slightly larger than usual; (2) smaller, with 20 arms; there are nine IIBr series of which four are 2 and five are 4 (3 + 4); the single IIIBr series, of 2, is internally developed on a ray with two IIBr 2 series.

Haingsisi: 17 arms 95 mm. long; two of the IIBr series are 2 and five are 4 (3 + 4); there are four broken cirri.

II. Family Zygometridae A. H. Clark.

Zygometra A. H. Clark.

Key to the Species of the Genus Zygometra.

a¹ More than 40 cirrus segments; more than 35 (usually 40 or more) arms (northern Australia and the Aru Islands)

b¹ more than 40 arms; most of the IIIBr and following division series 4 (3 + 4); proximal pinnules very stout and very long, tapering to a flagellate tip as in *Himerometra magnipinna*; cirri very long and stout (northern Australia and the Aru Islands) . . . . . *microdiscus*[1])

b² about 40 arms; most of the IIIBr and following division series 2; proximal pinnules of moderate length, and not especially stout; cirri not especially long nor stout (northern Australia) . . . . . *elegans*[2])

a² Less than 36 (usually 30 or less) cirrus segments; less than 40 (usually 20—30) arms

b¹ more than 25 (usually about 30) cirrus segments

c¹ border of the ossicles of the division series and of the first two brachials smooth and not produced (Mergui Archipelago to Singapore and the Malay Archipelago, northward to the Philippines and Hong Kong). . . . . *comata*

c² borders of the ossicles of the division series and of the first two brachials thickened and everted, finely scalloped or tuberculated (India). . . . . *andromeda*

1) Synonyms (?) *Hyponome sarsii* Lovén; *Antedon multiradiata* P. H. Carpenter; *Zygometra mertoni* Reichensperger.
2) Synonym *Antedon fluctuans* P. H. Carpenter.

b^2 less than 25 (18—21) cirrus segments

c^1 more than 10 arms; cirri rather stout, most of the cirrus segments being about twice as broad as long (northern Australia and the Aru Islands). . . . . *punctata* [1])

c^2 10 arms; cirri slender, the longer proximal segments about one third longer than broad (Philippine Islands). . . . . *pristina*

1. *Zygometra microdiscus* (Bell).

? Lovén. Forhandl. Skand. Naturf. Christiania, vol. 10, 1868, p. liv. (*Hyponome sarsii*).
Bell. "Alert" Report, 1884, p. 163, pl. 15 (*Antedon microdiscus*).
P. H. Carpenter. "Challenger" Reports. The Comatulae, 1888, pp. 96, 97; pl. 9; pl. 37, figs. 4—6 (*Antedon microdiscus* and *A. multiradiata*).
A. H. Clark. Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 367 (*Zygometra microdiscus*).
—— The Recent Crinoids of Australia, 1911, pp. 760, 761 (*Zygometra microdiscus* and *Z. multiradiata*).
—— The Crinoids of the Indian Ocean, 1912, pp. 103, 104 (*Zygometra microdiscus* and *Z. multiradiata*).
Reichensperger. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 90 (*Zygometra microdiscus*); p. 90, fig. 6, p. 91 (*Zygometra mertoni* [= young specimens]).
A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 20 (*Zygometra microdiscus*).

Stat. 273. Anchorage off Pulu Jedan, east coast of the Aru Islands (Pearl Banks); 13 Metres. 14 Ex.

This is by far the finest series of this handsome species that has ever been assembled from any one locality. The details of the specimens are as follows:

(1) 65 arms; colour yellow with small circular spots of red brown on the division series and arm bases; cirri yellow in the proximal half, each segment with a narrow dorsal purple saddle, in the distal half light purple.

(2) 60 arms, similar to the preceding; all the division series are 4 (3 + 4); cirri 40 mm. long, composed of 51—52 segments; the transition segment is about the twentieth; colour purple, darkest on the cirri, with a broad mediodorsal line of yellow on each arm.

(3) about 80 arms; one division series is 6 (3 + 4); yellow brown.

(4) about 75 arms about 110 mm. long; cirri 37 mm. long; yellow brown.

(5) 85 arms; yellow brown.

(6) about 100 arms; yellow brown.

(7) about 80 arms; yellow brown.

(8) about 65 arms about 85 mm. long; cirri 35 mm. long, composed of 49 segments; colour light yellow, concentrically banded with narrow bands of purple; cirri deep purple with occasional large yellow blotches.

(9) similar to the preceding.

(10) 85 arms 145 mm. long; cirri 40 mm. long, composed of 52—55 segments; colour yellow brown.

1) Synonym *Heterometra delicata* H. L. Clark.

(11) 80 arms about 100 mm. long; cirri 35—37 mm. long, composed of 48—51 segments; P_D 32 mm. long, with about 60 segments; colour nearly white, the cirri and the sides of the rays and arms deep purple.

(12) about 85 arms; colour yellow brown dorsally, purple ventrally.

The preceding specimens are all very uniform; division series of 2 are very rare; the proximal pinnules are typically very large and stout basally, tapering gradually and becoming flagellate distally; the distal edges of the segments in the outer half are prominent.

(13) a young specimen with 17 arms about 40 mm. long; two of the rays bear two arms each; two others bear four arms each, there being one IIBr 4 (3 + 4) series, bearing a IIIBr 2 series internally; the fifth ray bears one IIBr 4 (3 + 4) series carrying two IIIBr 2 series.

(14) a young specimen with 14 arms 25 mm. long; one IIBr series is present, bearing two IIIBr 4 (3 + 4) series; the synarthry between the ossicles of the IBr series is just beginning to transform into a pseudosyzygy.

2. *Zygometra comata* A. H. Clark.

L. von Graff. "Challenger" Reports. The Myzostoma, 1887, p. 2 (*Antedon comata* P. H. Carpenter, MS., nomen nudum).
P. H. Carpenter. "Challenger" Reports. The Comatulae, 1888, p. 265 (*Antedon elegans*, part; Semper's Philippine and Anderson's Mergui Archipelago specimens).
—— Journ. Linn. Soc. (Zool.), vol. 21, 1889, p. 305 (*Antedon elegans*).
A. H. Clark. Vid. Medd. fra den naturhist. Forening i København, 1909, p. 151 (*Zygometra fluctuans*).
—— The Recent Crinoids of Australia, 1911, p. 762, footnote (*Zygometra comata*).
—— The Crinoids of the Indian Ocean, 1912, p. 104, fig. 6, p. 105 (*Zygometra comata*).
—— Proc. Biol. Soc. Washington, vol. 26, 1913, p. 180 (*Zygometra comata*).

Stat. 162. Between Loslos and Broken Islands, west coast of Salawatti. 18 Metres. 2 Ex.
Stat. 179. Kawa Bay, west coast of Ceram. 36 Metres. 1 Ex.
Stat. 322. $1^1/_2$ miles south of Tandjong Lajar, south coast of Bawean Island. 32 Metres. 1 Ex.

The specimens from Stat. 162 are both young; one, badly broken, is entirely deep purple; the other, with 14 arms, is deep purple with a broad mediodorsal line of white on the arms.

The example from Stat. 179 has 20 arms 90 mm. long; there are six IIBr 4 (3 + 4) series and four IIIBr 2 series present, the latter all internal; the distal edges of the radials are obscurely beaded; the sides of the division series and rays bear a few irregular spinous processes; the cirri are XVIII, 28—33 (usually 30), 25 mm. long; long dorsal spines are developed from the 11^{th}—13^{th} segment onward.

From Stat. 322 there is a small individual with 16 arms 60 mm. long; five of the six IIBr series are 2 instead of 4 (3 + 4); the cirri are XVII, 27, 17 mm. long; the colour is deep purple.

3. *Zygometra punctata* A. H. Clark.

A. H. Clark. The Recent Crinoids of Australia, 1911, p. 768 (*Heterometra bengalensis*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 440, 443, 444, 446 (*Heterometra bengalensis*).

A. H. CLARK. The Crinoids of the Indian Ocean, 1912, p. 130 (*Heterometra bengalensis*; the Australian records).

—— Proc. Biol. Soc. Washington, vol. 25, 1912, p. 24 (*Zygometra punctata*).

REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 83 (*Zygometra punctata*).

A. H. CLARK. Die Fauna Südwest-Australiens, vol. 4, 1913, Lief. 6, pp. 313, 314 (*Zygometra punctata*).

—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 21 (*Zygometra punctata*).

H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 105 (*Heterometra delicata*).

Stat. 273. Anchorage off Pulu Jedan, east coast of the Aru Islands (Pearl Banks). 13 Metres. 4 Ex.

The best specimen may be described as follows:

The centrodorsal is discoidal, thin, with a broad flat circular dorsal pole 2.7 mm. in diameter.

The cirri are XV, 18—19 (usually 18), 9 mm. long; the first segment is very short, the second and third about three times as broad as long, the fourth about twice as broad as long, the fifth or sixth about as long as broad; the next two or three are similar, the following decreasing very gradually in length so that the distal ten or eleven are slightly broader than long; the sixth and following bear prominent sharp dorsal spines.

The radials are entirely concealed by the centrodorsal; the IBr_1 are very short and bandlike, six times or more as broad as long, united to the IBr_2 (axillaries) by pseudosyzygy; IBr_2 low triangular, with the lateral angles slightly truncated, three times as broad as long. IIBr series 4 (3 + 4), broad like the IBr series, with straight lateral edges which are more or less "wall-sided" and almost or quite in apposition; the lateral outer portions of the ossicles of the division series are roughened or very finely papillose, as in the species of *Mariametra*.

The twenty-one arms are 35 mm. long, comparatively short and rather stout; the first brachial is slightly wedge-shaped, three times as broad as the median length, entirely united internally; the second is much more obliquely wedge-shaped, twice as broad as the external length; the first syzygial pair (brachials 3 + 4) is slightly longer internally than externally, twice as broad as long internally; the following three brachials are oblong, three to four times as broad as long; the succeeding are wedge-shaped, twice as broad as long, becoming as long as broad terminally; the brachials have rather strongly produced distal edges.

The disk is entirely covered with a pavement of comparatively heavy calcareous plates which may, especially the larger ones on the anal tube, bear short spines or tubercles.

P_D resembles P_1, and is composed of 20 segments; P_1 is about 5 mm. long, rather stout basally but in the distal half tapering to a slender tip, composed of 20 segments of which the first is about three times as broad as long and the following gradually increase in length becoming as long as broad on the ninth and slightly longer than broad terminally; the longer proximal segments are rather strongly carinate, the carination having a straight profile which is parallel to the long axis of the segments; the short outer segments have slightly prominent distal ends; P_2 is similar, but very slightly smaller and shorter; P_3 is 2.5 mm. long, composed of 12 segments and, except for its small size, is similar to the preceding; P_4 is 2 mm. long with 12 segments of which the first three are much broader than long, the fourth about as long as broad, and the distal twice as long as broad; P_5 is 2.5 mm. long with 12 segments,

resembling P_4 but very slightly stouter basally and with longer distal segments; the following pinnules resemble P_5; the distal pinnules are 4 mm. long with 15 segments of which the distal are nearly or quite three times as long as broad.

The colour is white with numerous regular purple spots on the division series and arm bases and in band-like areas on the distal part of the arms; the cirri are white, with a band of purple on each segment.

In this specimen there are eight IIBr 4 (3 + 4) series and one IIBr 2 series; a IIIBr 2 series is developed internally on one of the IIBr 4 (3 + 4) series.

A similar specimen has seventeen arms, with five IIBr 4 (3 + 4) series and two IIBr 2 series; the cirri are XVII, 18, 9 mm. long.

The remaining two specimens are small.

This curious little species has caused considerable trouble. Its general appearance is such that it is very easily confused with *Heterometra bengalensis* with which, moreover, it agrees in colour, differing entirely from any species of Zygometridae heretofore known.

All of the records of *Heterometra bengalensis* from Australia (from Port Curtis and the Holothuria Bank) refer to this form.

Very recently Dr. Hubert Lyman Clark has redescribed this species (Publication N° 212 of the Carnegie Institution of Washington, 1915, p. 105) under the name of *Heterometra delicata*, basing his description upon a specimen which he found on the sand flat on the southern side of Friday Island, Torres Straits.

Catoptometra A. H. Clark.

Key to the Species of the Genus Catoptometra.

a^1 40—80 arms; all the division series 2 (Philippine Islands) . . . . . *magnifica*

a^2 less than 30 arms; IIBr series 4 (3 + 4)

b^1 11—13 arms; cirri short and stout, few or none of the component segments being longer than broad; in life banded broadly with brilliant red and brilliant yellow alternately (Hong Kong to southern Japan) . . . *rubroflava*

b^2 20 or more arms; cirri longer and less stout, the longest segments being twice as long as the median diameter; in life usually uniform in colour, yellow, brown or green, rarely red and yellow

c^1 20 arms; 15—16 cirrus segments; ossicles of the division series and first two brachials with prominently everted and produced spinous distal borders; dorsal pole of the centrodorsal papillose or finely spinous (southern Japan) . . . . . *hartlaubi* [1])

c^2 20—27 arms; 15—19 (usually 17—18) cirrus segments; ossicles of the division series and arm bases smooth; dorsal pole of the centrodorsal smooth; colour usually green, rarely red and yellow (Malay Archipelago and Philippine Islands) . . . . . *ophiura*

1) Synonym *Zygometra koehleri* A. H. Clark.

1. *Catoptometra ophiura* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 539.

Stat. 49a. 8° 23′.5 S., 119° 4′.6 E. 69 Metres. 2 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 Metres. 1 Ex.

All the specimens are badly broken. One of those from Stat. 49a has the centrodorsal broad and flat, discoidal, with the dorsal pole 6.5 mm. in diameter marked with faint radiating lines and pitted in the centre; the cirri are XXX, 17—19, 23 mm. or 24 mm. long; the cirri, and in fact the whole animal, are less robust than those of the type series.

The other specimen is slightly smaller, but exactly similar; the dorsal pole of the centrodorsal is 6 mm. in diameter; the cirri are XXVII, 17, 20 mm. long.

The arm bases, centrodorsal and cirri are light flesh colour, the latter becoming pinkish distally; the arms beyond the second syzygy are bright yellow-orange, regularly banded with bright red as in *C. rubroflava* and in *C. magnifica*.

The specimen from Stat. 294 has 13 arms; the three IIBr series are 4 (3 + 4); the dorsal pole of the centrodorsal is 3 mm. in diameter; the cirri are XX, 16, 20 mm. to 22 mm. long. This example resembles the preceding, but the centrodorsal is only half as broad; consequently the cirri appear shorter and more of the division series is visible.

Eudiocrinus P. H. Carpenter.

Key to the Species of the Genus Eudiocrinus.

a¹ Cirri very long, composed of much elongated segments of which the longest are four times as long as the median diameter or longer, and the distal are twice as long as broad; enlarged proximal pinnules stout basally, very long, tapering gradually to a delicate, almost flagellate, tip, and composed of 15 segments (Moluccas) . . . . . *junceus*

a² Cirri short, the longest segments never more than twice as long as broad, the distal segments about as long as broad

b¹ none of the cirrus segments are longer than broad

c¹ P_a, though elongated and stiffened, is slender like the succeeding pinnules, and is composed of 17 segments, of which the third and fourth are half again as long as broad, and the outer three or four times as long as broad (Lesser Sunda Islands). . . . . *pinnatus*

c² P_a is enlarged as well as stiffened, and is composed of 11 or 12 segments of which the first four are broader than long and the outer are about twice as long as broad (southern Japan). . . . . *variegatus*

b² the longer cirrus segments are about twice as long as the median diameter, the distal about as long as broad

c¹ the first segment of P_C bears a very large spatulate or fan-shaped process as high as its lateral diameter, and the following segments

bear high carinate processes which rapidly diminish in height distally; P_1 is similar to P_D, but the height of the dorsal processes on the segments is much reduced; the ossicles of the IBr series and the earlier brachials have the edges swollen and everted, and more or less scalloped or beaded (Timor and the Philippine Islands) *venustulus*

c^2 slight and uniform, if any, processes on the proximal segments of the proximal pinnules

d^1 the ossicles of the IBr series and the earlier brachials have everted and more or less produced edges, so that the dorsal profile of the base of the arm is strongly serrate

e^1 lower pinnules very sharply triangular; on P_1 and P_a the distal edges of the segments are very strongly produced at the prismatic angles, so that the pinnules have a strongly serrate dorsal profile (Philippine to the Lesser Sunda Islands) . . . . . *serripinna*

e^2 P_1 and P_a rounded triangular, the distal edges of the segments everted and spinous all around the dorsal side, this being slightly, if at all, accentuated at the prismatic angles (Andaman Islands to Timor) . . . . . *ornatus* [1])

d^2 the edges of the ossicles of the IBr series and the earlier brachials are only slightly, if at all, everted, so that the dorsal profile of the base of the arms is smooth

e^1 third segment of P_1 and P_a half again as long as broad (Burma). . . . . *gracilis*

e^2 third segment of P_1 and P_a not longer than broad (Philippine Islands and the Macclesfield Bank to the Moluccas, the Kei and Lesser Sunda Islands) *indivisus* [2])

1. *Eudiocrinus junceus* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 25.

Stat. 167. 2° 35'.5 S., 131° 26'.2 E. 95 Metres. 16 Ex.

The centrodorsal is discoidal, moderately thick, the sides sloping inward rather strongly; the dorsal pole is from 1 mm. to 1.5 mm. in diameter, and flat; the cirrus sockets are arranged in two closely crowded irregular rows.

The cirri are XXV, 22—23 (usually 22), 23 mm. long; the apical cirri are 12 mm. long with 17 segments. The cirri are greatly elongated with greatly elongated segments, slender, tapering gradually from the base to the tip, though rather more in the first three or four segments than subsequently. As a whole the cirri strongly suggest an approach to the type

1) Synonym *Eudiocrinus minor* A. H. Clark.
2) Synonym *Eudiocrinus granulatus* Bell.

characteristic of such species as *Pentametrocrinus varians* or *P. japonicus*. The first cirrus segment is very short, the second not so long as broad, the third nearly or quite twice as long as the proximal diameter, the fourth and following about four times as long as the median diameter; the sixth-eighth segments are the longest, the length from that point onward diminishing almost imperceptibly so that the seventeenth and following are slightly over twice as long as broad and the penultimate half again as long as broad, tapering somewhat distally; the opposing spine is represented by a small rounded subterminal tubercle; the terminal claw is slightly longer than the penultimate segment, very slender, very sharp, and only slightly curved. The second and third cirrus segments are rather strongly constricted centrally; the sixth and following have moderately expanded and slightly overlapping distal ends, this character gradually dying away distally. The cirri are rather strongly compressed laterally from the fifth segment onward.

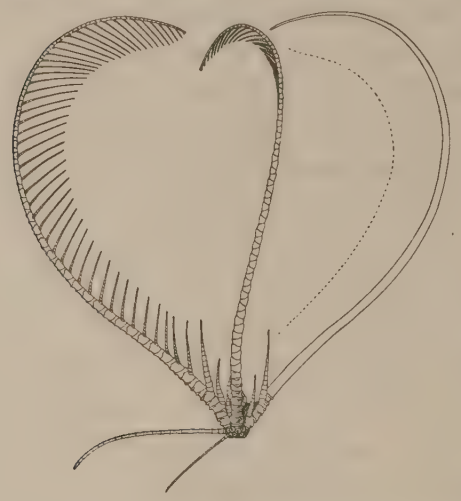

Fig. 3.
Lateral view of a specimen of *Eudiocrinus junceus* from Stat. 167. Natural size. (Courtesy of the U.S. National Museum).

The radials are just visible beyond the edge of the centrodorsal; their distal border is swollen and everted, smooth or evenly tuberculated.

The IBr series (the first two ossicles following the radials) forms an oblong unit which is not quite twice as broad as long; both the proximal and distal borders are turned outward, the former slightly, but the latter standing up at right angles to the general surface of the segment, with a smooth and somewhat thickened edge; the proximal border may be more or less scalloped, and it bears just within it a prominent rounded tubercle; the produced distal edge is thickest and most prominent in the middorsal half, this portion being evenly concave; the remainder of the distal edge may be irregularly scalloped.

The five arms are 90 mm. long; the first brachial is oblong, two and one half to three times as broad as long; the proximal and distal edges are slightly thickened and everted; the second brachial is similar, but the distal edge is prominently everted, especially in the middle third where it is thickened, and concave distally, and stands up vertically from the dorsal surface of the joint face; the third and fourth brachials (forming the first syzygial pair) are together slightly longer on one side than on the other, about twice as broad as the lesser length, resembling the IBr series but with the tubercle within the median part of the proximal border only just indicated; the following three brachials are slightly wedge-shaped, about twice as broad as the median length, their distal borders everted as described for the second brachial, but progressively less and less so; following brachials triangular, about as long as broad, with slightly produced and overlapping distal edges; the fourth-ninth bear a low rounded median carination, this after the ninth becoming the low rounded zigzag keel characteristic of the arms of all the species of the genus, which is traceable throughout the length of the arm. Syzygies occur between brachials 3 + 4, 8 + 9 and 13 + 14 (usually) to 15 + 16, and distally at intervals of from 2 to 4 (usually 3) oblique muscular articulations.

P_C is 6.5 mm. long and composed of 15 segments, rather stout basally, but tapering to a very delicate tip; the first segment is short, the following increasing in length and becoming about as long as broad on the fourth or fifth, and twice as long as broad terminally; the second-sixth bear a narrow sharp straight edged carination which is equally high on each; the prismatic edge is sharp; the outer surface of the pinnulars (between the prismatic angles) is flat or very slightly concave. P_1 is similar, 6.5 mm. long with 13 or 14 segments. P_a is 11 mm. long, much larger and stouter than those preceding, but evenly tapering and becoming very delicate distally, composed of 15 segments, at first short, becoming about as long as broad on the fourth and three times as long as broad distally; the second-fourth bear a low even carination; the second and following have the distal edges all around produced and finely spinous; following pinnule (on the opposite side of the arm) 11 mm. long with 15 segments, exactly resembling P_a; P_b 8 mm. to 10 mm. long with 19 segments, very slender; the proximal segments are as small as the first segments of P_1; the first segment is short, more or less crescentic; the second is about twice as broad as the median length; the third is not so long as the distal breadth; the fourth is from one third to one half again as long as broad; the following gradually increase in length, after the eighth becoming from three to four times as long as broad; the fifth and following have slightly produced and spinous distal edges; P_3 is 10 mm. or 11 mm. long with 18 or 19 segments, similar to P_b; P_c is 8 mm. long with 17 segments, very slender, more slender than P_b, with more elongated segments; P_4 is similar to P_c; P_d is 7 mm. long with 18 segments, resembling P_c, but even more delicate and with more elongate segments; P_5 is similar to P_d; P_e is 6.5 mm. long with 16 segments, resembling P_d; P_6 is similar to P_e; the distal pinnules are 8.5 mm. long with 20 excessively slender segments.

The disk is naked.

The colour is white.

Another specimen has the arms 80 mm. long, and the cirri XXVIII, 22, 21 mm. long; the lateral and proximal edges of the IBr series are bordered with numerous regular tubercles, which give the impression of rows of little beads. A specimen similar to that just mentioned, with arms 80 mm. long, has the distal border of the radials also beaded. There are 10 additional specimens essentially resembling these. Three very small specimens with arms 20 mm. long and cirri with 10 segments have, as is usual in small comatulids, greatly elongated cirrus segments with swollen articulations.

Some of the examples have a few small light brown dots on the dorsal surface of the arms which on the brachials tend to form lines along the zigzag dorsal carination.

2. *Eudiocrinus pinnatus* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 27.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 Metres. 1 Ex.

The centrodorsal is discoidal, the flat dorsal pole 2 mm. in diameter; the cirrus sockets are arranged in two rows.

The cirri are XVII, 17—22 (usually 21—22), 10 mm. to 11 mm. long; all the segments

beyond the third are subequal, none being quite so long as broad; the fourth to the eighth or ninth have slightly prominent distal edges, especially dorsally. The cirri are rather stout, of the same type as those of the Japanese *E. variegatus*.

The five arms are about 75 mm. long; the brachials are unornamented, and their distal edges are not produced.

P_C is 4 mm. long with 11 segments, moderately stout, strongly prismatic, evenly tapering to the tip, the distal border of the segments sharply, though narrowly, carinate; P_1 is 4.5 mm. long with 12 segments, similar to P_C; P_a is 11 mm. long with 17 segments, very slender like the succeeding pinnules, though very stiff; the first two segments are slightly broader than long, the third and fourth half again as long as broad, the following gradually increasing in length and becoming distally three or four times as long as broad; the distal edges of the third and following segments are produced and spinous; the pinnule resembles the lower pinnules in certain of the more slender species of *Colobometra*; P_2 is similar to P_a, 11 mm. long with 17 segments; P_b is similar to P_3, 8 mm. long with 18 segments; P_3 is 8 mm. long with 18 segments, proportionately more slender than P_2 and with much shorter segments, which become as long as broad on the third and twice as long as broad proximally on the tenth or eleventh; P_c and P_4 are 7.5 mm. long with 18 segments, and resemble the preceding pinnules; the distal pinnules are 12 mm. long with 20—24 segments which beyond the fifth are twice, and distally are three times, as long as broad, with very finely spinous distal ends.

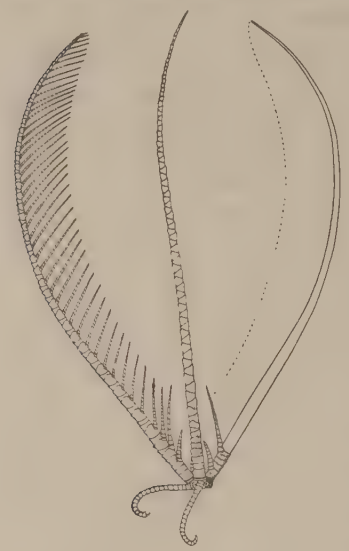

Fig. 4.
Lateral view of a specimen of *Eudiocrinus pinnatus* from Stat. 310. Natural size. (Courtesy of the U. S. National Museum).

The colour is white, the perisome of the pinnules purple; on either side of the middorsal line of the arms there is a broad yellow brown line; these lines are always parallel, so that there is between them a uniform white middorsal streak of about their own width; beyond the arm bases they become faint and assumexa zigzag course, shortly after which they disappear.

The characteristic features of this species are the stout cirri composed of very short segments, and the very slender proximal pinnules; in the first of these it agrees with *E. variegatus* of Japan.

3. *Eudiocrinus venustulus* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 27.

Stat. 289. 9°0′.3 S., 126°24′.5 E. 112 Metres. 3 Ex.
Stat. 294. 10°12′.2 S., 124°27′.3 E. 73 Metres. 55 Ex.

The centrodorsal is thin discoidal, the bare dorsal pole flat, finely papillose, 1 mm. in diameter; the cirrus sockets are arranged in a single marginal row.

The cirri are XII, 15—16, 6.5 mm. long, rather slender; the first segment is short, the

second longer, the third about as long as the median diameter; the fifth and sixth are the longest, about as long as their distal diameter or slightly longer; the segments following the eighth are subequal, slightly longer than broad; the third-seventh segments are constricted centrally, with strongly expanded distal ends which overlap the bases of the succeeding segments, especially dorsally; beyond the seventh this character gradually dies away.

The distal edge of the radials is just visible beyond the edge of the centrodorsal, and is ornamented with a row of small regular tubercles; the IBr series (comprising the first two ossicles beyond the radials) is oblong, not quite twice as broad as long, with the proximal, distal and lateral edges everted; the lateral edges are beaded like the distal edge of the radials; the proximal edge is faintly scalloped and bears a prominent median tubercle; the distal edge has the median third of the eversion thickened and standing up vertically as a high transverse ridge; the pseudosyzygial line is finely beaded; the first brachial is oblong, about three times as broad as long; the proximal edge is slightly everted, with a prominent, though small, median tubercle; the distal edge is strongly everted and thickened, this thickened and everted border being more or less divided in the middle; the second brachial is very slightly larger than the first, about twice as broad as long; the distal edge is everted, the central third of this eversion being thickened and produced; the first syzygial pair (composed of brachials 3 + 4) is about as long as broad, or slightly longer than broad; the proximal edge is slightly everted, with a minute median tubercle; the distal edge is slightly everted, with a slightly larger, more or less transversely elongate, median tubercle; the following brachials have finely spinous distal ends which are not produced nor everted; a slight median tubercle is visible on the proximal border of the brachials up to the first or second beyond the second syzygy; there is a very low and faint median carination on the first syzygial pair and on the following brachials which is accentuated by being light in colour, bordered with dark on either side; on the triangular brachials this becomes zigzag as in the other species of the genus.

The five arms are 60 mm. long.

P_C is 3 mm. long with 10 segments; the first bears a very large fan-shaped, rounded or distally truncated carinate process which is about as high as the lateral diameter of the segment; the second bears a high carinate process half as high as the lateral diameter of the segment, of which the crest is parallel to the longitudinal axis of the pinnule; the following segments are similarly, but diminishingly, carinate; P_1 is similar; P_a is 5 mm. long with 11 or 12 segments, of which the first is short, the second nearly as long as broad, the third about as long as broad, and the distal twice as long as broad; the pinnule is rather slender and not greatly enlarged, rather strongly prismatic; the distal edges of the third and following segments are slightly produced and finely spinous, with prominent spines at the angles of the prism; the ventral borders of the segments bear very numerous fine spines; the first segment has a strongly rounded carinate process, and the second and third are narrowly, though sharply, carinate; P_2 is similar to P_a; P_b is 4 mm. long with 13 segments, slightly more slender than P_a; the first segment is short, the second slightly longer, the third about as long as broad; the distal segments are much elongated with a few long spines on the everted distal edges; the proximal segments are not carinate; the following pinnules are similar, though weaker and more slender with

slightly longer segments distally which bear a few conspicuous spines on their overlapping distal ends; the distal pinnules are exceedingly slender, 7 mm. long with 17 segments of which the third and following are greatly elongated; the third bears a narrow carination.

A second specimen is similar to the one described; the third, with the same arm length and number of cirri, has the production of the distal edges of the lower brachials and of the proximal pinnule segments more pronounced.

The 55 specimens from Stat. 294 vary in arm length from 27 mm. to 65 mm., most of them being between 55 mm. and 65 mm. Even in the smallest the carination of the earlier pinnule segments is nearly as strong as in the adults, though more rounded and not truncate nor dentate distally; but only the median swollen portion of the eversion of the borders of the brachials is developed. In these specimens the carination of the first pinnule segment is often much higher than the transverse diameter of the segment, fan-shaped, and with a dentate crest.

A specimen from "Albatross" Stat. 5355, Philippine Islands, 44 fathoms (Cat. N° 36009 U. S. Nat. Mus.), appears to belong to this species.

4. *Eudiocrinus ornatus* A. H. Clark.

A. H. Clark. The Crinoids of the Indian Ocean, 1912, p. 99, and p. 102 (*E. minor*), fig. 4, p. 100, and fig. 5, p. 103 (juv.).

Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 Metres. 2 Ex.

One of the specimens may be described as follows:

Centrodorsal discoidal, the cirrus sockets arranged in two rows; the bare dorsal pole is 2.5 mm. in diameter.

The cirri are XXI, 18, 12 mm. long, comparatively slender; the segments increase in length to the fourth-sixth, which are about twice as long as the proximal diameter; the distal seven or eight are about as long as broad; the longer segments are centrally constricted with widely flaring distal ends.

The distal edge of the radials and the proximal border of the IBr_1 are slightly thickened and turned outward; there is a slight tubercle in the centre of the latter; the distal edge of the IBr series is everted, the middle fourth thickened into a transversely elongate tubercle; the central half of the distal border of the proximal discoidal brachials is everted and spinous; the distal edge of the following brachials is slightly produced and finely spinous; the lateral borders of the IBr series are finely dentate.

P_C is 5 mm. long, composed of 12 segments; P_1 is 7.5 mm. long with 15 segments; P_2 is 12 mm. long with 16—18 segments, at first short, becoming about as long as broad on the fourth, twice as long as broad on the eighth or ninth, and slightly longer terminally; the pinnule is only moderately stout; the segments overlap slightly along the prismatic crest, where there is a slight development of spines on their distal ends; in profile the prismatic crest is slightly notched.

The other specimen is similar; it has arms 50 mm. long.

It is quite possible that this form should be regarded not as a distinct species, but as a strongly marked variety of *E. indivisus*, bearing the same relation to the latter that *Cotylometra gracilicirra* does to *Cotylometra gracilicirra ornata*.

5. *Eudiocrinus serripinna* A. H. Clark.

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, part 2, p. 211.

Stat. 49ª. 8° 23′.5., 119° 4′.6 E. 69 Metres. 1 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 Metres. 1 Ex.

This specimen from Stat. 310 has the cirri XIX, 14—15 (usually the latter), 10 mm. long; the first segment is short, the following gradually increasing in length so that the fourth and following are about as long as the median diameter; in the longest cirri the fifth-eighth may be one third longer than broad basally; the fourth-seventh or -eighth are centrally constricted with expanded distal ends, this expansion being especially marked dorsally so that the dorsal profile of the cirrus is rather strongly serrate, but this dies away distally so that after the tenth segment the dorsal profile becomes smooth and straight; the fifth is a more or less marked transition segment.

The five arms are 55 mm. long.

P_2 is composed of 12—13 segments, as in the type specimen.

This example differs from the type of the species only in its slightly greater size.

The individual from Stat. 49ª has the ornamentation of the brachials slightly more accentuated than in the preceding.

It is possible that this, like the preceding, is merely a very strongly marked variety of *E. indivisus*.

6. *Eudiocrinus indivisus* (Semper).

Semper. Archiv für Naturgesch. 1868, I, p. 68 (*Ophiocrinus indivisus*).
P. H. Carpenter. Journ. Linn. Soc. (Zoöl). vol. 16, 1882, p. 495.
Bell. Proc. Zoöl. Soc. London, 1894, p. 397, pl. XXIII (*Eudiocrinus granulatus*, sp. nov.).
A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 102.

Stat. 65ª. Kambaragi Bay, Tanah Djampeah, 400—120 Metres. 2 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 2 Ex.
Stat. 257. In Du-Roa Strait, Kei Islands. Up to 52 Metres. 2 Ex.
Stat. 260. 5° 36′.5 S., 132° 55′.2 E. 90 Metres. 2 Ex.
Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 3 Ex.

The two specimens from Stat. 65_a are small, with arms from 25 mm. to 30 mm. long.

The four examples from Stats. 144 and 257 are also small; in these the brachials, except the basal, show a strong production of the distal edge.

The individuals from Stat. 260 have the arms 35 mm. and 40 mm. long.

Of the specimens from Stat. 305 one has the arms 80 mm. long, the cirri XVIII, 17, 11 mm. long, and the second pair of pinnules 6 mm. long with 11—12 segments; another has the arms 95 mm. long, the cirri XVII, 16, 17, 13 mm. long, and the second pair of pinnules 7 mm. long with 12—13 segments; the third specimen is similar to the first.

These agree minutely with specimens from the Philippine Islands, taken by the "Albatross" at Stat. 5356 (Cat. N° 35139 U. S. Nat. Mus.).

III. Family Himerometridae A. H. Clark.

Key to the Genera of the Family Himerometridae.

a¹ P_D longer and stouter than P_1, which in turn is longer and stouter than P_2; division series narrow, strongly rounded dorsally, widely separated; IIIBr series on the outer side of each IIBr series 4 (3 + 4), on the inner side usually 2; large and robust species with from 20 to 65 (rarely less than 30) arms which are usually between 100 mm. and 150 mm. long (Persian Gulf to the Kei Islands, the Admiralty Islands, St. Mathias Island, the Philippines and Cochin China) . . . **Himerometra**

a² P_D shorter and more slender than P_1, which in turn is shorter and more slender than P_2 (in ten armed types P_1 is shorter and more slender than P_2, and the latter is shorter and more slender than P_3)

b¹ more than 10 arms

c¹ cirri very slightly curved (nearly straight), gradually tapering to a sharp point distally, the distal segments proportionately as long as, or longer than, the proximal, twice as long as broad or even longer, and entirely without dorsal processes; no opposing spine; terminal claw long and nearly straight

d¹ cirri very long and stout, the proximal portion light in colour, each segment with a ventral purple saddle, the distal portion dark brown, composed of 42—46 segments; division series usually broad, well rounded dorsally, not in lateral contact; large and robust species with from 20 to 36 arms usually between 100 mm. and 130 mm. in length (Burma to Hong Kong, and southward to the Andaman Islands and Sydney, New South Wales) **Craspedometra**

d² cirri small, very slender, entirely white in colour, composed of 25—30 segments; 10 or 11 arms from 70 mm. to 90 mm. in length (Arafura Sea; Moluccas). . . . . **Homalometra**

c² cirri not especially long and not noticeably stout; the distal portion is more or less strongly recurved; the distal cirrus segments are always much shorter than the proximal, and usually bear more or less prominent dorsal spines, more rarely being simply carinate dorsally; the opposing spine is always well developed and prominent; the terminal claw is of moderate length or short, strongly curved (east Africa from Madagascar and Bagamoyo to Suez, eastward to the Moluccas and northern Australia, and northward to southern Japan) **Heterometra**

b² 10 arms only

c¹ cirri large, never slender, usually stout, tapering only very slightly, if at all, distally; distal cirrus segments shorter than the proximal, broader than long, bearing prominent tubercles or spines dorsally; opposing spine long and well developed; terminal claw stout, strongly curved (Maldive Islands and Ceylon to northern Australia, and northward to southern Japan) . . . . . **Amphimetra**

c² cirri small, very slender, nearly straight, tapering to a sharp point; distal cirrus segments proportionately as long as, or longer than, the proximal, more than twice as long as broad, with no dorsal processes; no opposing spine; terminal claw long, very slender, and nearly straight (Arafura Sea; Moluccas) . . **Homalometra**

Himerometra A. H. Clark.

Key to the Species of the Genus Himerometra.

a¹ Enlarged proximal pinnules slender, flagellate distally, and very long (slightly more than one half the length of the cirri), composed of from 36 to 40 perfectly smooth segments most or all of which are longer than broad; a few of the earlier segments are narrowly, but prominently, carinate; the earlier segments of the following pinnules are very strongly carinate; the segments in the outer half of the cirri have prominent dorsal spines

b¹ 20 to 25 arms; about 35 cirrus segments; all of the segments in the proximal pinnules are longer than broad (Persian Gulf) . . *persica*

b² 35 to 61 arms; about 40 cirrus segments; a few of the basal segments in the proximal pinnules are broader than long (Philippine Islands) *bartschi*

a² Enlarged proximal pinnules very stout, with all or nearly all of the component segments broader than long, or at least as broad as long; none of the segments are carinate; following pinnules without carinate processes on the earlier segments

b¹ enlarged proximal pinnules with about 30 segments, very stout basally and distally gradually tapering to a delicate and flagellate tip; the distal edges of the segments in the middle half or proximal two-thirds are swollen and may be strongly everted, but are always smooth, never spinous

c¹ cirri very stout, stouter than in any other species of the genus; the enlarged proximal pinnules have the segments in the basal two-thirds with strongly produced and everted distal edges (Maldive Islands) . . . . . *sol*

c² cirri rather short and weak, without, or with only slight traces of, dorsal processes on the outer segments; the enlarged proximal

pinnules have the segments in the middle half with slightly swollen distal edges (Cochin China, Philippine and Admiralty Islands, and St. Mathias Island). . . . . *magnipinna*

b² enlarged proximal pinnules with 20 or fewer segments, distally tapering more or less abruptly, and without a flagellate tip

c¹ segments of the enlarged proximal pinnules entirely smooth; the distal edges of the component segments may be slightly swollen, or they may be unmodified, but they are never spinous; distal edges of the proximal brachials smooth, or only very slightly produced (Ceylon, Arrakan coast, Burma, Amboina, the Sunda, Kei and Philippine Islands, and Macclesfield Bank) . . . . . *robustipinna* [1])

c² segments of the enlarged proximal pinnules with prominently everted and spinous distal ends; distal edges of the proximal brachials strongly produced and everted (Singapore and north Borneo). . . . . *martensi*

1. *Himerometra magnipinna* A. H. Clark.

HARTLAUB. Nachr. Ges. Göttingen, Mai 1890, p. 185 (*Antedon crassipinna*, part; specimen from Cochin China).

—— Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 32 (but not figs. 1, 5, 10 on pl. 1) (*Antedon crassipinna*, part, the specimen from Cochin China; the specimens from Amboina, upon which the descriptions and figures are based, represent *H. robustipinna* [P. H. Carpenter]).

A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, p. 356 (*Himerometra crassipinna*, part).

—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, p. 214 (*Himerometra magnipinna*; "Albatross" Stat. 5139, Philippine Islands, between Joló and Pangasinan Island, in 20 fathoms (type locality); and Stat. 5147, off Balinpongpong Island, south of Joló, in 21 fathoms).

—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Himerometra magnipinna*, and *H. crassipinna*, part).

—— Proc. U. S. National Museum, vol. 39, 1911, p. 540 (*Himerometra magnipinna*; Ulugan Bay, Palawan).

—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 17 (*Himerometra magnipinna*; redescription and identification of Hartlaub's specimen from Cochin China).

—— Proc. U. S. National Museum, vol. 43, 1912, p. 394 (*Himerometra magnipinna*).

—— Crinoïds of the Indian Ocean, 1912, p. 114 (*Himerometra magnipinna*); p. 116 (*H. crassipinna*; record from Cochin China).

Stat. 209. Anchorage off the south point of Kabaëna Island. Reef. 1 Ex.

One small and immature specimen with twelve arms 45 mm. long. Two IIBr 4 (3 + 4) series are developed on one ray; the cirri are XV, 18—21, 17 mm. long. On the arms arising directly from the IBr series P_1 is much larger than P_2, the proportions being as on the free

1) *Himerometra kraepelini* Reichensperger, Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 83; *H. crassipinna*, p. 98.

undivided arms of the adult. The longer proximal cirrus segments are half again as long as broad, and are constricted centrally, so that the cirri, which are rather slender, have very much the appearance of the cirri of *Stephanometra monacantha* or of *Dichrometra protectus*. The dorsal pole of the centrodorsal is slightly convex.

2. *Himerometra bartschi* A. H. Clark.

A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, p, 212 (*Himerometra bartschi*); p. 214 (*H. persica*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 164 (*Heterometra martensi*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Himerometra bartschi*, and *H. persica*, part).
—— Crinoids of the Indian Ocean, 1912, p. 114 (*Himerometra bartschi*); p. 116 (*H. persica*; records from the Philippines).

Stat. 96. Southeastern side of Pearl Bank, Sulu Archipelago. 15 fathoms. 1 Ex.

This specimen has 61 arms 120 mm. long; four of the rays bear 12 arms each, the fifth 13; each IIBr series bears externally a IIIBr 4 (3 + 4) series, internally a IIIBr 2 series which bears two IVBr 4 (3 + 4) series.

The cirri are rather stout, 30 mm. long with 37—38 segments; the longest proximal segments are from half again to twice as broad as long; there is very little difference between the proximal and distal segments; from the nineteenth or twentieth segment onward prominent dorsal tubercles or short blunt dorsal spines are developed.

P_D is 23 mm. long with 37 segments, very stout basally but tapering evenly to a slender and flagellate tip, the basal segments are twice as broad as long, the following gradually increasing in length and becoming about as long as broad on the twelfth, and half again as long as broad in the delicate terminal portion; the pinnule is perfectly smooth, with no trace of eversion of the distal edges of the segments. P_P is 22 mm. long with 36 segments, only very slightly smaller than P_D. P_1 is similar to the two preceding but somewhat smaller, 17 mm. long. P_2 is weak and slender, 8.5 mm. long with 23 segments of which the second-fifth have a prominent narrow carination the distal border of which is parallel to the longitudinal axis of the segments. P_3 is 6.5 mm. in length, resembling P_2 but very slightly smaller. P_4 is 5.5 mm. long, resembling P_3 but very slightly smaller; the second-fourth segments are carinate. From this point the amount of carination of the earlier segments of the pinnules decreases, though it is traceable to the end of the proximal fourth of the arm.

This specimen differs from the type specimen only in the slightly smaller size and in the slightly shorter proximal cirrus segments.

Heterometra A. H. Clark.

Key to the Species of the Genus Heterometra.

a[1] Enlarged proximal pinnules without prominent keels on their earlier segments
  b[1] enlarged proximal pinnules smooth, slender, the component segments without lateral processes or produced and spinous distal edges

c^1 outer cirrus segments with a slight median keel, but no dorsal spines nor tubercles; 25—35 (usually about 30) cirrus segments; 16—26 arms 60 mm. to 80 mm. long; division series rather broad with slightly produced borders, though not in contact beyond the IBr axillary (Philippine Islands to Singapore). . . . . *quinduplicava*[1])

c^2 outer cirrus segments with dorsal spines; division series narrow, strongly rounded dorsally, well separated, without produced margins

d^1 usually 20 arms up to 125 mm. in length; P_2 and P_3 very long and slender, perfectly smooth, evenly tapering, composed of about 20 segments; cirri with 23—33 (usually 25—30) segments of which the outer bear long dorsal spines (Red Sea to the Persian Gulf and Kurrachi) . . . . . *savignii*

d^2 38 arms over 80 mm. long; enlarged lower pinnules composed of about 30 segments; cirri composed of 40—50 segments of which the outer bear prominent, though not especially long, dorsal spines (Aru Islands; Queensland) . . . . . *nematodon*

b^2 component segments of the enlarged proximal pinnules with spinous distal edges, or with a production of the distal portion, or all, of the prismatic angles, so that each segment has three distal tubercles, or three broad thin longitudinal lateral processes

c^1 enlarged lower pinnules with numerous short cylindrical segments which have everted and spinous distal borders; 28—37 cirrus segments of which the outer bear long dorsal spines; 23—28 arms 50 mm. to 140 mm. long (Amboina to Canton, China). . . . . *variipinna*[2])

c^2 enlarged lower pinnules with more or less strongly prismatic segments which bear more or less developed tubercles at the prismatic angles on the distal borders, or broad longitudinal lateral processes with the bases coinciding with the prismatic ridges

d^1 small and delicate species with not more than 13 arms which are from 50 mm. to 100 mm. in length; cirri slender, the outer segments long, as long as, or longer than, broad; the segments of the lower pinnules have the distal ends of the prismatic angles, especially the dorsal, swollen and produced, sometimes crowned with spines

e^1 cirri composed of 23—26 segments which after the tenth or eleventh are about as long as broad (Maldive Islands to Singapore). . . . . *producta*

e^2 cirri composed of 30—33 segments all of which are about twice as long as broad at the expanded ends (Java Sea) . . . *propinqua*

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1) Includes *Antedon clemens* P. H. Carpenter, 1888, and *Antedon anceps* P. H. Carpenter, 1888.
2) Includes *Antedon brockii* Hartlaub, 1890.

d² larger and more robust, with from 14 to 26 (usually from 15 to 20) arms from 100 mm. to 150 mm. long; division series and arm bases very rugged, the segments swollen, with prominent synarthrial and articular tubercles; lower pinnules stout, with the distal portion, or all, of the prismatic ridges on the segments produced into broad rounded lateral processes, giving the pinnules a strongly serrate profile; cirri moderately stout with 35—45 (usually about 40) segments (Northern Australia to Pocock Island, Singapore and the Philippine Islands) . . . *crenulata* [1])

a² Enlarged proximal pinnules with prominent keels on the distal border of the segments

b¹ IIIBr series present, 4 (3 + 4); cirri with 30—44 (usually 35—40) segments, none of which are quite so long as broad; 20—25 arms 150 mm. long; division series and first two brachials in close lateral apposition and laterally flattened; only the carinate processes of the lower segments of P_D are visible between the IIBr series (Andaman Islands to Java and the Malay Peninsula) . . . . . *philiberti* [2])

b² IIIBr series 2, or absent

c¹ the outer cirrus segments bear long and prominent sharp dorsal spines, which begin abruptly

d¹ cirri very stout, all the component segments much broader than long; 12—13 arms 170 mm. to 180 mm. long; cirri XV, 30 (Maldive Islands) . . . . . *flora*

d² cirri slender, or moderately stout, the longest earlier segments as long as or longer than broad

e¹ 20—23 arms 120 mm. to 125 mm. long; brachials in the outer half of the arm oblong and very short; cirri about one sixth of the arm length, composed of 25—32 (usually 27—30) segments (German Southeast Africa, Zanzibar, and British East Africa). . . . . *africana*

e² 11—13 arms

f¹ brachials in the central and outer part of the arm exceedingly short and discoidal; radials with a row of bead-like tubercles along the distal border; cirri XV, 26—35 (usually 30—35), about one fourth of the arm length; P_2 and P_3 composed of 18—25 segments (southern Japan) . . . . . *schlegelii*

f² brachials in the central and outer part of the arm wedge-

1) Includes *Comatula dubia* von Graff, 1877, *Antedon decipiens* and *A. irregularis* Bell, 1884, *Antedon bidentata* von Graff, 1884, *Antedon dubia* P. H. Carpenter, 1888, and *Craspedometra aliena* A. H. Clark, 1909, with the exception of the ten armed specimens mentioned in the description of the last named.

This species has usually been recorded as *Antedon* (or *Amphimetra*) *variipinna*, but it is not *Antedon variipinna* P. H. Carpenter, 1882.

2) Includes *Amphimetra mortenseni* A. H. Clark, 1909.

shaped with produced distal edges; radials with numerous prominent rounded tubercles on the dorsal surface; cirri with 26—31 segments; P_2 and P_3 with about 20 segments (Straits of Malacca to Singapore) . . . . . *singularis*

c² the outer cirrus segments bear dorsal tubercles or short spines, which develop very gradually

d¹ 31—43 (usually over 35) cirrus segments

e¹ the longest and stoutest pinnules at the base of the arm have from 20 to 25 segments; P_2 is from half again to twice as long as P_1; 16—24 arms

f¹ P_3 the largest and longest pinnule, with 20—22 segments; P_2 almost as long as P_3; cirri with 32—40 segments of which the outer bear small dorsal tubercles or spines

g¹ the longest cirrus segments are slightly longer than broad; the short distal segments are but little longer than broad; rather small, though sharp, dorsal spines are developed from the 20th segment onward (southwest of the mouths of the Irrawaddy River) . . . . . *pulchra*

g² none of the cirrus segments are longer than broad; the outer bear small dorsal tubercles, and the terminal sometimes prominent spines (Amboina) . . . . . *amboinae*

f² P_2 the longest pinnule, with 21—24 segments

g¹ P_2 half again as long as P_1 or P_3, which are approximately equal in length, with 21 segments; 39—43 cirrus segments (Zanzibar) . . . . . *joubini*

g² P_2 half again as long as P_1, but only slightly longer than P_3, which is much larger than P_1; P_2 has 24 segments; 36—39 cirrus segments; a more delicate species than the preceding (Zanzibar) . . . . . *gravieri*

e² the longest and stoutest pinnules on the base of the arm have from 26 to 30 segments

f¹ not over 16 arms; 32—36 cirrus segments; lower pinnules strongly carinate; enlarged proximal pinnules with the second-fifth segments strongly carinate

g¹ P_2 twice as long as P_1; P_3 much smaller, slightly longer than P_1 (Red Sea; ? Ceylon[1]) . . . . . *ater*

g² P_2 slightly longer than P_1; P_3 slightly longer than P_2 (Madagascar) . . . . . *madagascarensis*

1) The specimen from Ceylon described by REICHENSPERGER (Abhandl. der Senck. naturforsch. Ges. vol. 35, 1913, Heft 1. p. 99) under the name of *Craspedometra amboinae* appears to belong to this species; at any rate it is closely related to it. His specimen from Amboina is undoubtedly *H. amboinae*.

f^2 from 16 to 25 arms

g^1 P_2 and P_3 stout, flagellate distally, very long; P_3 markedly longer and stouter than P_2; 31—42 cirrus segments; colour usually light, with the cirri purple, at least distally (Ceylon and the eastern coast of India to Burma) . . *reynaudii*

g^2 lower pinnules slender and relatively short, P_1, P_2 and P_3 being not greatly different in length; P_2 and P_3 are markedly stouter than P_1, and P_3 is usually slightly stouter than P_2 though the reverse often occurs; 31—35 cirrus segments; colour violet, the cirri light yellow, sometimes entirely light yellow brown (western coast of India) *compta*

d^2 21—32 (rarely over 30) cirrus segments; P_2 and P_3 similar and of about the same length, not greatly longer than P_1, though stouter

e^1 brachials beyond the proximal very short with strongly produced distal edges; 26—31 cirrus segments; 14—18 arms (Singapore) . . . . . *aspera*

e^2 brachials longer with more oblique ends which overlap only very slightly if at all

f^1 11—15 arms (Ceylon and the eastern coast of India) *bengalensis*

f^2 16—18 arms (Amboina to the Philippine Islands) . *affinis*

1. *Heterometra crenulata* (P. H. Carpenter).

VON GRAFF. Das Genus *Myzostoma*, 1877, pp. 15, 22, 72, 79 (*Comatula dubia*).

P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 507 (*Antedon crenulata*).

BELL. Proc. Zoöl. Soc. London, 1882, p. 534 (*Antedon decipiens* and *Antedon irregularis*).

P. H. CARPENTER. Proc. Zoöl. Soc. London, 1882 (1883), p. 746 (*Antedon decipiens*, *A. crenulata* and *A. irregularis*).

BELL. „Alert" Report, 1884, p. 159, pl. 11, figs. B, B*a* (*Antedon decipiens*); p. 161, pl. 13, figs. A, *Aa—c* (*Antedon irregularis*).

VON GRAFF. "Challenger" Reports. Myzostoma, 1884, pp. 15, 18 (*Antedon dubia*); pp. 15, 16 17 (*Antedon bidentata*); Narrative, vol. 1, 1885, part 1, p. 316 (*Antedon bidentata*); Myzostoma, 1887, part 61, p. 7 (*Antedon bidentata*).

P. H. CARPENTER. Quart. Journ. Micros. Sci., vol. 28, 1887, p. 386 (*Antedon irregularis*).

—— "Challenger" Reports. Comatulae, 1888, pp. 110, 197, 258, pl. 36, figs. 1—6 (*Antedon dubia*); pp. 97, 262 (*Antedon bidentata*); p. 256, pl. 36, figs. 1—6; pl. 48, figs. 3—5; pl. 49, figs. 1—2 (*Antedon variipinna*).

BRAUN. Centralbl. für Bakteriol.- und Parasitenkunde, vol. 3, 1888, p. 185 (*Comatula dubia*); p. 186 (*Antedon bidentata*).

HARTLAUB. Nova Acta der ksl. Leop.-Carol. deutschen Akademie der Naturforsch., vol. 58, 1891, N° 1, p. 17 (in key) (*Antedon variipinna*).

BELL. Proc. Zoöl. Soc. London, 1894, p. 394 (*Antedon variipinna*).

KOEHLER. Mem. soc. zool. France, vol. 8, 1895, p. 419 (*Antedon variipinna*).

CHADWICK. in Herdman, Ceylon Pearl Oyster Report, part 2, 1904, p. 157 (*Antedon variipinna*).

MINCKERT. Archiv für Naturgesch., 1905, I, p. 212 (footnote) (*Antedon variipinna* and *Antedon dubia*).

A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 214 (*Himerometra anceps*); p. 216 (*Himerometra variipinna*).

A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 156 (*Amphimetra variipinna*).
—— Proc. U. S. National Museum, vol. 37, 1909, p. 31 (*Craspedometra aliena*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 540 (*Amphimetra variipinna*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 440, 443, 444, 446 (*Amphimetra variipinna*).
—— Memoirs of the Australian Museum, vol. 4, 1911, part 15, p. 764 (*Amphimetra variipinna*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 16 (*Amphimetra crenulata*).
—— Crinoids of the Indian Ocean, 1912, p. 110 (*Amphimetra variipinna*); p. 120 (*Craspedometra anceps*, part).
—— Die Fauna Südwest-Australiens, vol. 4, 1913, Lief. 6, p. 314 (*Amphimetra variipinna* auct. = *A. crenulata*, but not *Antedon variipinna* P. H. Carpenter, 1882).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 22 (*Amphimetra crenulata*).
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 92 (*Amphimetra variipinna*); p. 99 (*Craspedometra anceps* P. H. Carpenter [*C. aruensis* n. sp.?]).

Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 7 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. 57 fathoms. 2 Ex.

The specimens from Stat. 273 exactly resemble others from northwestern Australia; the arms are stout, basally strongly flattened laterally, and very rugose; the development of the lateral processes on the pinnule segments is very strong. One very fine typical example has 22 arms 120 mm. long; all the IIBr series are 4 (3 + 4); both the IIIBr series are 2, internal; the colour is white, the outer part of the pinnules and cirri violet. Another has 20 arms 110 mm. long; two of the IIBr series are absent; all the IIBr series are 4 (3 + 4); the two IIIBr series, both internally developed, are 2; the colour is similar to that of the preceding, with in addition a few narrow purple bands and blotches on the outer part of the arms. A third has 16 arms 120 mm. long; there are five IIBr 4 (3 + 4) series, and one IIIBr series of 2, internally developed. A fourth has 16 arms 115 mm. long; there are six IIBr 4 (3 + 4) series. The three remaining examples are similar.

The two from Stat. 274 are small; the larger has 13 arms 75 mm. long; there are three IIBr 4 (3 + 4) series on three separate rays; the colour is flesh-coloured, with regular narrow purple bands on the arms.

2. *Heterometra propinqua* (A. H. Clark).

A. H. CLARK. Ann. and Mag. Nat. Hist. (8), vol. 10, 1912, p. 32 (*Amphimetra propinqua*).

Stat. 318. 6° 36′.5 S., 114° 55′.5 E. 88 Metres. 6 Ex.
Stat. 320. 6° 5′ S., 114° 7′ E. 82 Metres. 2 Ex.

The cirri are VIII—XIII, 24—36 (usually 30—33), 26 mm. to 32 mm. (usually about 30 mm.) long; they are very slender, and taper gradually in the proximal third, being especially slender from that point onward. In general they recall the cirri of *Leptometra celtica*. All the cirrus segments are approximately subequal in length, about twice as long as broad at the ends, though those in the distal third of the cirrus are slightly carinate, which makes them appear slightly shorter, and those in the proximal half are slightly longer, with slightly expanded ends; on the outermost segments there is a slight indication of dorsal tubercles.

The arms vary from 10 to 13 (usually 11—13) in number, and are from 90 mm. to 120 mm. long.

P_1 is 7.5 mm. long with 18 segments which, gradually increasing in length, become about as long as broad on the fourth or fifth and twice as long as broad terminally; the second-eighth have a strong, though rounded, supplementary ridge (this not being indicated in *H. producta*). P_2 is 10.5 mm. long with 17 segments, slightly stouter basally than P_1, but tapering less gradually and composed of longer segments; the supplementary ridge occurs on the second-ninth. P_3 is similar to P_2, 9 mm. long. P_4 is 6 mm. long with 11 segments, a supplementary ridge on the second-fourth or -fifth. P_2 and P_3 are not stouter basally than the succeeding pinnules, but they taper with slightly less rapidity; the distal angles of their component segments are only slightly swollen and produced — about as in *H. producta*. The distal pinnules are 10 mm. long, composed of 20 segments.

The colour is brownish white, with occasional narrow bands of rusty on the arms; the cirri are white.

This species is most closely related to *H. producta*, but is even more slender and delicate. The elongate distal cirrus segments serve to distinguish it at once.

The characters of the six specimens from Stat. 318 are included in the above description.

One of those from Stat. 320 has 11 arms 120 mm. long, with one IIBr 4 (3 + 4) series; the cirri are 30 mm. long with 33 segments. The other is smaller with 12 arms about 55 mm. long, both the IIBr series being 2, and the cirri 20 mm. long.

3. *Heterometra quinduplicava* (P. H. Carpenter).

P. H. CARPENTER. Quart. Journ. Geol. Soc., Feb. 1880, pp. 41 (footnote), 42, 43 (*Antedon*, sp., from Stat. 212).
—— "Challenger" Reports. Comatulae, 1888, p. 229, pl. 39, fig. 5 (*Antedon clemens*); p. 254, pl. 35, figs. 1—3 (*Antedon anceps*); p. 262, pl. 4, figs. 1 *a—d*; pl. 47, figs. 4, 5 (*Antedon quinduplicava*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 214 (*Himerometra quinduplicava*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra anceps*); p. 11 (*Heterometra quinduplicava*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 162 (*Heterometra quinduplicava*).
—— Crinoids of the Indian Ocean, 1912, p. 120 (*Craspedometra anceps*, except reference to *C. aliena*, which latter is *H. crenulata*); p. 130 (*Heterometra quinduplicava*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 23 (*Amphimetra anceps*); p. 27 (*Heterometra quinduplicava*).

Stat. 99. Anchorage off North Ubian. 16—23 Metres. 1 Ex.

The 26 arms are 80 mm. long; two of the arms arise directly from IBr axillaries; there are eight IIBr series of 4 (3 + 4) each of which bears internally a IIIBr series of 2. The cirri are XVIII, 27—30, 22 mm. long.

This resembles exactly a specimen dredged by the "Albatross" at Stat. 5139, near Joló (Sulu), in 20 fathoms (Cat. N° 35183 U. S. National Museum).

4. *Heterometra affinis* (Hartlaub).

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. Deutschen Akad. der Naturforscher, vol. 58, 1891; N° 1, p. 25, pl. 1, fig. 14; pl. 2, figs. 18, 24 (not 21 as given in the reference to the plate) (*Antedon affinis*).

Stat. 99. 6° 7′.5 N., 120° 26′ E. (Anchorage off North Ubian). 16—23 Metres. 1 Ex.

The specimen has fifteen arms about 70 mm. long; each IBr series bears on the right hand side (as viewed dorsally) a IIBr 4 (3 + 4) series; the two additional arms on the left anterior ray are as yet only 22 mm. in length, measuring from the axillary. The longest cirrus has 29 segments.

This appears to be a young individual just completing the adolescent autotomy.

Amphimetra A. H. Clark.

Key to the Species of the Genus Amphimetra.

a[1] Cirri very stout, composed of very short subequal segments which are usually about four times as broad as long; the outer segments, which are relatively very slightly longer than the proximal, bear small sharp median spines

b[1] larger and stouter; cirri very large and stout, usually evenly curved throughout the entire length, never tapering distally, composed of 45—51 segments of which the distal half or two thirds bear dorsal spines; arms from 150 mm. to 170 mm. long (Philippine Islands). . . . . *spectabilis*

b[2] smaller and more delicate; cirri very stout basally, but usually tapering more or less distally, usually curved much more strongly in the distal than in the proximal half, composed of 34—37 segments of which nearly all bear dorsal spines; arms from 100 mm. to 115 mm. long (Maldives to the Sunda Islands, the Moluccas, the Philippines and Singapore) . . . . . *molleri*

a[2] Cirri more slender, more or less straight in the proximal half but strongly curved distally, composed of segments which are longer in the proximal portion than distally; the proximal segments are from twice as broad as long to as long as, or slightly longer than, broad

b[1] the basal segments of the pinnules in the proximal fourth of the arm are strongly carinate; P_4 is the largest and longest pinnule, slightly larger and longer than P_3, and twice as long as the distal pinnules; cirri XII, 30—33; arms 150 mm. long (Philippine Islands; ? North Borneo) . . . *parilis*

b[2] the basal segments of the earlier pinnules are not carinate; the longest proximal pinnule is usually P_3, more rarely P_2, which is very little, if any, longer than the distal pinnules

c[1] cirri stout, not tapering distally; all of the cirrus segments are markedly broader than long

d¹ 28—50 (usually about 40) cirrus segments; arms 115 mm. to 300 mm. long; the dorsal spines on the outer cirrus segments appear in lateral view as broad triangles with the apex produced and subterminal instead of small sharp median spines as in spectabilis and molleri (Sunda Islands and Moluccas southward to between Fremantle and Geraldton, Western Australia) . . . *jacquinoti*

d² 25 cirrus segments, of which the outer bear long and sharp dorsal spines; arms about 60 mm. long; P_2 with 12 thick segments, larger and much stouter than P_1 or P_3, which are subequal, though the latter is stouter basally (Northwestern Australia and New Guinea) . . . . . *pinniformis*

c² cirri more slender, tapering more or less distally, the longer proximal segments about as long as broad, sometimes slightly longer than broad, more rarely slightly broader than long

d¹ usually 40—50 (32—51) cirrus segments which bear small dorsal spines from about the 18th onward; arms usually about 130 mm. long; synarthrial tubercles usually prominent, though not excessively developed, and pointed (northern and eastern Australia to Singapore, Formosa, and the Philippine Islands) . . *discoidea*

d² not over 35 cirrus segments; arms not over 120 mm., usually not over 100 mm., in length

e¹ synarthrial tubercles very high, extravagantly developed; 30 cirrus segments; arms 80 mm. long (Singapore) . . . . . *ensifer*

e² synarthrial tubercles slightly, or not at all developed

f¹ dorsal spines on the outer cirrus segments small or medium in length (Canton, China, to southern Japan) . . . . *laevipinna*

f² dorsal spines on the outer cirrus segments long and conspicuous (New Guinea to Tonga and Fiji) . . . . . *papuensis*

1. *Amphimetra spectabilis* A. H. Clark.

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 215 (*Himerometra milberti*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra milberti*, part).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 156 (the species referred to under the name of *Amphimetra milberti* in the discussion of *A. mölleri*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 540 (*Amphimetra milberti*).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra milberti*, part).

Localities. — Only known from the Philippine Islands; "Albatross" Stat. 5100, South Channel, Manila Bay, 35 fathoms (Cat. N° 35245, U. S. National Museum); and Limbones Cove ("Albatross" Coll.; Cat. N° 35196 U. S. National Museum).

2. *Amphimetra molleri* (A. H. Clark).

VON GRAFF. "Challenger" Reports. Myzostoma, 1887, part 61, p. 1 (*Antedon milberti*).
BELL. Proc. Zoöl. Soc. London, 1888, p. 389, footnote (*Antedon milberti*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 194, pl. 35, figs. 4—6 (*Antedon milberti*, part; "Challenger" specimens, and those recorded from Padan Bay, Mergui Archipelago).
—— Journ. Linn. Soc. (Zoöl.), vol. 21, 1889, p. 310, pl. 27, figs. 6, 7 (*Antedon milberti*).
HARTLAUB. Nova Acta der ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 81 (*Antedon milberti*; specimen from Atjeh).
KOEHLER. Mem. soc. zool. France, vol. 8, 1895, p. 418 (*Antedon milberti*).
BELL. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, p. 224 (*Antedon laevissima*, part).
CHADWICK. in Herdman, Report Ceylon Pearl Oyster Fisheries, part 2, 1904, Suppl. Rep. 11, p. 154 (*Antedon milberti*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 356 (*Himerometra milberti*, part).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1580 (*Antedon milberti*, part).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 222 (*Himerometra molleri*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra molleri*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 156 (*Amphimetra mölleri*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 181 (*Amphimetra molleri*).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra milberti* part); p. 112 (*Amphimetra molleri*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 24 (*Amphimetra milberti*, "Challenger" specimens, but not the specimen from Port Molle, which represents *A. jacquinoti*; and *Amphimetra molleri*).

Localities. — Maldive Islands, Suvadiva, 43 fathoms (BELL; A. H. CLARK); Ceylon, Gulf of Manaar, outside Dutch Moderagam Paar, $11^1/_2$—36 fathoms, orbitolites sand, nullipores and dead coral; 5 miles west and southwest of Negombo, 12—20 fathoms, coarse yellow sand with a few dead shells, 77°.5 Fahrenheit (CHADWICK); "Indian Ocean" (A. H. CLARK); King Island (native name Padaw Island), Mergui Archipelago, "half of them from mud-flats exposed at spring tide" (VON GRAFF, BELL, P. H. CARPENTER); Singapore (A. H. CLARK); Straits of Malacca (A. H. CLARK); Java Sea (A. H. CLARK); Atjeh, Sumatra (HARTLAUB; A. H. CLARK); Sunda Islands (KOEHLER); East Indies (A. H. CLARK); Philippine Islands, "Challenger" Station 203, off Panay (11°06′ N., 123°09′ E.), 20 fathoms, mud, and "Challenger" Station 212, off Zamboanga (6°54′ N., 122°18′ E.), 10 fathoms, sand (P. H. CARPENTER; A. H. CLARK); ? Brazil (A. H. CLARK).

3. *Amphimetra parilis* A. H. Clark.

? GRUBE. Jahresber. der schlesisch. Ges. für vaterl. Cultur, 1875, p. 74 (*Comatula laevissima*, part).
? BELL. Proc. Zoöl. Soc. London, 1882, p. 533 (*Antedon laevissima*, part).
? P. H. CARPENTER. Proc. Zoöl. Soc. London, 1882 (1883), p. 746 (*Antedon laevissima*, part).
? A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, p. 7 (*Amphimetra laevissima*, part).
—— Proc. U. S. National Museum, vol. 37, 1909, p. 32 (*Amphimetra parilis*).
—— Crinoids of the Indian Ocean, 1912, p. 112 (? *Amphimetra laevissima* part; *A. parilis*).

Localities. — Philippine Islands, "Albatross" Station 5147, off Balinpongpong Island (south of Joló), 21 fathoms (A. H. CLARK); ? North Borneo (Grube).

Remarks. — Judging from what CARPENTER says in the "Challenger" Report it appears possible that my *Amphimetra parilis* is the same as one of the two specimens upon which GRUBE based his *Comatula laevissima*. As yet I have had no opportunity of examining these.

4. *Amphimetra jacquinoti* (J. Müller).

J. MÜLLER, Monatsber. d. k. preuss. Akad. d. Wiss., 1846, p. 178 (*Comatula jacquinoti*).
—— Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 255 (*Comatula jacquinoti*).
DUJARDIN et HUPÉ. Hist. nat. des zoophytes. Échinodermes, 1862, p. 202 (*Comatula jacquinoti*).
P. H. CARPENTER. Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1879, p. 29 (*Antedon jacquinoti*).
BELL. Proc. Zoöl. Soc. London, 1882, pp. 533, 534 (*Antedon jacquinoti*).
P. H. CARPENTER. Proc. Zoöl. Soc. London, 1882 (1883), p. 746 (*Antedon jacquinoti*).
BELL. "Alert" Report, 1884, p. 156 (*Antedon milberti*, part; one specimen from Port Molle).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 194 (*Antedon milberti*, part; Ceram and Port Molle, ex J. MÜLLER and BELL).
KOEHLER. Revue suisse zool., vol. 3, 1895, fasc. 2, p. 289 (*Antedon milberti*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 356 (*Himerometra milberti*, part).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1580 (*Antedon milberti*, part.).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra milberti*, part).
—— Bull. du mus. d'hist. nat., Paris, 1911, N° 4, p. 250 (*Amphimetra milberti*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 440, 443 (*Amphimetra milberti*); p. 444 (*Amphimetra discoidea*); p. 459 (*Amphimetra discoidea*, specimen here originally recorded, and records from Western Australia).
—— Memoirs of the Australian Museum, vol. 4, 1911, N° 15, p. 767 (*Amphimetra milberti*); p. 459 (*Amphimetra discoidea*, west Australian specimen).
—— Proc. U. S. National Museum, vol. 43, 1912, p. 393 (*Amphimetra discoidea*).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra milberti*, part); p. 112 (*Amphimetra discoidea*, part).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 24 (*Amphimetra milberti*; specimen from Port Molle).
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 95 (*Amphimetra milberti*).
A. H. CLARK. Records of the Western Australian Museum, vol. 1, 1914, N° 3, p. 123 (*Amphimetra discoidea*).
—— Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 223 (*Amphimetra milberti*).

Stat. 33. Bay of Pidjot, Lombok. 22 Metres and less. 4 Ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. 32 Metres. 2 Ex.

The largest specimen from Stat. 33 has the arms 135 mm. long; the centrodorsal is thick discoidal, with the dorsal pole broad and convex, 7 mm. in diameter; the cirri are XXIV, 44—47 (usually 46—47), 45 mm. to 50 mm. long; the cirri are rather stout basally, but taper very appreciably distally; rather prominent dorsal spines are developed from the thirteenth or fourteenth segment onward; the synarthrial tubercles are small, but sharp and prominent; the disk is almost completely covered with a pavement of rather small plates; the cirrus segments are subequal, the longest (in the proximal portion) being slightly broader than long; the ends of the cirrus segments in the earlier part of the cirri are slightly swollen and prominent. Another

has arms 130 mm. long and cirri XIII, 38—40, 35 mm. to 40 mm. long; the dorsal spines begin on the fifteenth to the seventeenth; the longest cirrus segments are half again as broad as long. A third has arms 115 mm. long and cirri XIV, 34—41, about 30 mm. long; the dorsal spines begin on the tenth to the thirteenth segments; on several of the cirri the two to eight spines following the first three or four have a longitudinally elongate chisel-like apex, or are longitudinally paired; the longest cirrus segments are half again as broad as long; the colour is whitish, becoming purplish toward the end of the cirri and arms. The fourth has the arms 115 mm. long and the cirri XVII, 41—43, 35 mm. to 40 mm. long; the longest cirrus segments are half again as broad as long; spines are developed from the twelfth onward; the colour is purple.

In the two specimens from Stat. 164 the arms and cirri are slightly stouter than in the preceding, and the cirri are proportionately shorter with a less marked production of the distal ends of the segments; in one the arms are about 140 mm. long, and the cirri are XVII, 34, 27 mm. long; the longest cirrus segments are from half again to twice as broad as long; spines are developed from the tenth or eleventh onward, and the earlier spines are double as described above; the colour is violet, the cirri yellow becoming violet distally in one example.

These two closely resemble specimens at hand from Western Australia. The cirri are proportionately shorter than in those from Lombok, and the dorsal and ventral profile of the individual segments is much less concave so that they appear much smoother, as in the Western Australian variety.

Remarks. — The chief feature of this species is the long stout cirri which taper only very slightly if at all distally, and are composed of short approximately equal segments which are never so long as broad; as I remember it the type, from Ceram, and those just described from Lombok have the cirri much less curved than the others which I have examined; but the latter were killed by immersion in fresh water, which may account for their condition; those from Lombok have the longest proximal cirrus segments with the most produced distal ends.

My notes on the type, which I examined during a recent visit to Paris, are as follows:

"Les cirres sont gros et larges, distalement comprimés; du 12^{e} ou 13^{e} article on trouve des épines dorsales qui sont assez proéminentes; le premier article est très court; les suivants augmentent progressivement jusqu'aux 8^{e} ou 9^{e}, qui atteignent en longueur une moitié de la largeur; tous les articles des cirres sont à peu près égaux en grandeur. Il y a dix bras, qui sont robustes; les plaques radiales sont cachées; l'article IBr_1 est très court, à peu près entièrement uni avec les voisins; l'article IBr axillaire est presque triangulaire, et atteint une largeur de deux fois la longueur, ils ne se touchent pas tout à fait latéralement; les tubercules synarthriaux ne sont que légèrement développés; les articles brachiaux sont extrêmement courts, un peu imbriqués; les pinnules sont comme dans l'*Amphimetra milberti* décrite par Carpenter (c'est à dire l'*Amphimetra molleri*). La couleur est d'un noir brunâtre".

Localities. — Ceram (J. Müller; P. H. Carpenter; A. H. Clark); Amboina (Koehler; Reichensperger); northeast of Misool (1°42′.5 S., 130°47′.5 E.), 32 Metres (see above); Bay of Pidjot, Lombok, 22 Metres and less (see above); Port Molle, Queensland (Bell; A. H. Clark); ? Vicinity of Perth (A. H. Clark); between Fremantle and Geraldton, Western Australia, 60—100 fathoms (A. H. Clark).

5. *Amphimetra discoidea* (A. H. Clark).

GRUBE. Jahresber. der schlesisch. Ges. für vaterl. Cultur, 1875, p. 74 (*Comatula laevissima*, part).
BELL. Proc. Zoöl. Soc. London, 1882, p. 533 (*Antedon laevissima*, part).
P. H. CARPENTER. Proc. Zoöl. Soc. Londen, 1882 (1883), p. 746 (*Antedon laevissima*, part).
BELL. "Alert" Report, 1884, p. 156 (*Antedon milberti*, part).
—— Proc. Linn. Soc. New South Wales, vol. 9, 1884 (1885), p. 497 (*Antedon milberti*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 194 (*Antedon milberti*, part; Australian records).
BELL. Proc. Zoöl. Soc. London, 1894, p. 394 (*Antedon milberti*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 356 (*Himerometra milberti*, part).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1580 (*Antedon milberti*, part).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 214 (*Himerometra anceps*, specimens without definite locality; the others represent *Heterometra quinduplicava*); p. 215 (*Himerometra discoidea*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra laevissima*, part, and *Amphimetra milberti*, part).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, pp. 156, 157 (*Amphimetra formosa*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, p. 459 (*Amphimetra discoidea*, except specimens here originally recorded, which represent *A. jacquinoti*, and the specimens from New Guinea, which represent *A. papuensis*).
—— Bull. du mus. d'hist. nat., Paris, 1911 N° 4, p. 250 (*Amphimetra discoidea*).
—— Memoirs of the Australian Museum, vol. 4, 1911, part 15, p. 766 (*Amphimetra discoidea*).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra milberti*, part); p. 112 (*Amphimetra laevissima*, part, and *Amphimetra discoidea*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 24 (*Amphimetra discoidea*).
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 93 (*Amphimetra discoidea*).
A. H. CLARK. Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, pp. 223, 224 (*Amphimetra discoidea*).

Stat. 99. Anchorage off North Ubian. 16—23 Metres. 1 Ex.
Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 16 Ex.

The specimen from Stat. 99 is typical, and resembles others at hand from Australia; it is yellow brown, the cirri and pinnules purple.

A typical example from Stat. 273 has the arms 115 mm. long, and the cirri XV, 32—34, 22 mm. long; the longest cirrus segments are slightly broader than long; the disk is almost completely covered with plates. There are twelve similar specimens, and two small and immature.

A four-rayed individual similar to that described was secured; the missing ray appears to be the anterior.

These specimens exactly resemble others at hand from Queensland and from northwestern Australia. The cirri are comparatively slender, tapering distally.

Remarks. — DUJARDIN and HUPÉ mention that in the Paris Museum they found a comatulid bearing the name *Comatula dibrachiata*. I examined what I suppose is the same specimen, a dried individual brought from Australia by MM. PÉRON and LESUEUR. In my notes

I wrote: "Cet exemplaire a été déterminé par CARPENTER comme '*Comatula* (*Antedon*) *milberti* var. *dibrachiata*'; il ressemble complètement à l'original de l'United States National Museum (de l'*Amphimetra discoidea*). Les cirres ont 26 ou 27 articles. Je crois que cet échantillon a servi à GUÉRIN-MÉNEVILLE pour l'original de sa figure de *Comatula carinata* dans son Iconographie du règne animal".

Localities. — Takao, Formosa (Taiwan) (A. H. CLARK); Philippine Islands, between Joló (Sulu) and Pangasinan Island, 19 fathoms ("Albatross" Stat. 5138), and without more definite locality (A. H. CLARK); North Borneo (GRUBE); Singapore (A. H. CLARK); Aru Islands (REICHENSPERGER); Aru Islands, anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks), 13 Metres (see above); North Ubian, anchorage, 16—23 Metres (see above); Australia (A. H. CLARK); Western Australia (A. H. CLARK); Holothuria Bank, northwestern Australia, 15 fathoms (A. H. CLARK); northwestern Australia, 8—15 fathoms (BELL; A. H. CLARK); Prince of Wales Channel (BELL); same locality, 7—9 fathoms (P. H. CARPENTER); same locality and depth, sandy bottom (A. H. CLARK); Torres Straits (BELL); same locality, 10 fathoms (P. H. CARPENTER); same locality and depth, sandy bottom (A. H. CLARK); Port Denison, Queensland (BELL; A. H. CLARK); same locality, 3—4 fathoms (P. H. CARPENTER); Port Molle, Queensland (BELL; A. H. CLARK); Port Molle, 12—20 fathoms (P. H. CARPENTER; A. H. CLARK).

6. *Amphimetra ensifer* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 225 (*Himerometra ensifer*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra ensiformis*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 158 (*Amphimetra ensifer*).
—— Crinoids of the Indian Ocean, 1912, p. 113, (*Amphimetra ensifer*).

Locality. — Singapore.

7. *Amphimetra laevipinna* (P. H. Carpenter).

P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 502 (*Antedon laevipinna*).
—— "Challenger" Reports. Comatulae, 1888, p. 206 (*Antedon laevipinna*, in key).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, Abt. 3, p. 1580 (*Antedon laevipinna*).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 223 (*Himerometra schlegelii*, 10-armed specimen).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra milberti*, part, and *Amphimetra schegelii* (sic), part).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 158 (*Amphimetra schlegelii*, part).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, pp. 15, 17 (*Amphimetra laevipinna*).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra schlegelii*, part; *Amphimetra milberti*, record from Canton, China).
—— Proc. Biol. Soc. Washington, vol. 26, 1913, p. 179 (*Amphimetra laevipinna*).

Localities. — Canton, China (P. H. CARPENTER; A. H. CLARK); Japan (A. H. CLARK); no locality (A. H. CLARK).

8. *Amphimetra papuensis* A. H. Clark.

A. H. Clark. Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, p. 459 (*Amphimetra discoidea*; records from New Guinea).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra schlegelii*, part; records from New Guinea, Tonga and Fiji).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 25 (*Amphimetra papuensis*).

Localities. — Port Moresby and Hood Lagoon, New Guinea, Tonga and Fiji (A. H. Clark).

9. *Amphimetra pinniformis* (P. H. Carpenter).

P. H. Carpenter. Notes from the Leyden Museum, vol. 3, 1881, pp. 175, 180 (*Antedon pinniformis*).
Bell. Proc. Zoöl. Soc. London, 1882, p. 533, 534 (*Antedon pinniformis*).
P. H. Carpenter. Proc. Zoöl. Soc. London, 1882 (1883), p. 746 (*Antedon pinniformis*).
—— "Challenger" Reports. Comatulae, 1888, pp. 193, 378 (*Antedon pinniformis*).
Hamann. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt 3, p. 1579 (*Antedon pinniformis*).
A. H. Clark. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Oligometra pinniformis*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 182 (*Amphimetra pinniformis*).
—— Crinoids of the Indian Ocean, 1912, p. 113 (*Amphimetra pinniformis*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 25 (*Amphimetra pinniformis*).

Localities. — Andai, New Guinea (P. H. Carpenter; A. H. Clark); Holothuria Bank, northwestern Australia, 15 fathoms (A. H. Clark).

Doubtful Species of Amphimetra.

10. *Amphimetra milberti* (J. Müller).

J. Müller. Monatsber. d. k. preuss. Akad. d. Wiss., 1846, p. 178 (*Comatula* [*Alecto*] *milberti*).
—— Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 255 (*Comatula* [*Alecto*] *milberti*).
Dujardin et Hupé. Hist. nat. des zoophytes. Échinodermes, 1862, p. 202 (*Comatula milberti*).
Verrill. Trans. Connecticut Acad. Arts and Sci., vol. 1, 1867, p. 341 (*Antedon milberti*).
Pourtalès. Bull. Mus. Comp. Zoöl., vol. 1, 1869, p. 356 (*Antedon* [*Comatula*] *milberti*).
P. H. Carpenter. Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1879, p. 29 (*Antedon milberti*).
Bell. Proc. Zoöl. Soc. London, 1882, p. 534 (*Antedon milberti*).
P. H. Carpenter. Proc. Zoöl. Soc. London, 1882 (1883), p. 746 (*Antedon milberti*).
—— "Challenger" Reports. Comatulae, 1888, p. 194 (*Antedon milberti*, part).
A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 356 (*Himerometra milberti*, part).
Hamann. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1580 (*Antedon milberti*, part).
A. H. Clark. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra milberti*, part).
—— Crinoids of the Indian Ocean, 1912, p. 111 (*Amphimetra milberti*, part).

Remarks. — By some mischance I overlooked Müller's type of this species when I was studying the collections at Paris.

Carpenter says "Under this name (*milberti*) I have united the two species that were found by Müller in the Paris Museum with the MS. names '*Comatula Milberti*' and '*Comatula Jacquinoti*' respectively, which had been given to them by Valenciennes. They are each based upon single specimens which I was able to examine carefully in 1876, and again in 1880; and

the subsequent study of a considerable amount of material obtained by H. M. S. S. 'Challenger' and 'Alert', and also by Dr. J. ANDERSON, F. R. S., of the Calcutta Museum, has convinced me that the two types are really identical. MÜLLER hardly ever made any comparison of his species with one another, but simply contented himself with descriptions, leaving his readers to determine the real points of difference between his various species . . . . . The differences between *Comatula milberti* and *Comatula jacquinoti* as described by MÜLLER, are in reality exceedingly slight. The number of cirrus joints, the character of the radials and of the arm joints, the colour, and even the size are respectively identical in the two types. *Comatula milberti* has twenty-five to thirty cirri with the spines transverse, while in *Comatula jacquinoti* there are twenty-two cirri with the spines directed forwards. In *Comatula milberti* the syzygial interval is eight or nine joints, and the second, third and fourth pinnules are the largest, while in *Comatula jacquinoti* the syzygial interval is three to six joints and the first three or four pinnules are 'stärker'. Neither of these characters, however, nor even the combination of them, can be regarded as of specific value, especially when we remember that each of MÜLLER's species was based upon a single specimen. That of *Comatula jacquinoti* had been obtained at Ceram by the expedition of d'URVILLE in the "Zelée" (1841), while the form which MÜLLER described under the specific name *milberti* had previously received it from VALENCIENNES in honour of M. MILBERT of New York, who had given it to the Paris Museum; and it was possibly for this reason that the type was labelled as coming from North America. Under these circumstances VALENCIENNES, and after him MÜLLER, were perhaps a little predisposed to regard it as distinct from the *Comatula jacquinoti* of Ceram, which MÜLLER described along with it and in such nearly identical terms".

On the basis of CARPENTER's statement we would be justified in considering *jacquinoti* a synonym of *milberti*, as he did. But unfortunately he included under the name *milberti* in the "Challenger" report, in addition to *jacquinoti*, the species which we now know as *molleri* and *discoidea*, later adding *laevipinna*. It is by no means certain, therefore, that according to the present standards *jacquinoti* would be considered identical with *milberti*. What the latter really is must be left for future investigation to determine.

Locality. — Supposed to be North America; the type was brought from New York; but the genus, as well as the family to which it belongs, is exclusively Indo-Pacific.

11. *Amphimetra sinensis* (Hartlaub).

HARTLAUB. Mem. Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 378, pl. 13, fig. 4 (*Antedon sinensis*).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 26, 1913, p. 179 (*Amphimetra sinensis*).

Remarks. — Dr. HARTLAUB places this species near *Amphimetra milberti*, but from the description it would appear to belong to the Colobometridae, falling possibly in the genus *Decametra*.

Locality. — Hong Kong.

12. *Amphimetra tessellata* (J. Müller).

J. MÜLLER. Monatsber. d. k. preuss. Akad. d. Wiss., 1841, p. 184; Archiv für Naturgesch., 1841, I, p. 144 (*Alecto tessellata*).
—— Abhandl. d. k. preuss. Akad. d. Wiss., 1841 (1843), p. 224 (*Alecto tessellata*).

J. MÜLLER. Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 251 (*Comatula tessellata*).
DUJARDIN et HUPÉ. Hist. nat. des zoophytes. Échinodermes, 1862, p. 202 (*Comatula tessellata*).
WYVILLE THOMSON. Phil. Trans. Roy. Soc., vol. 155, 1865, p. 537 (*Antedon tessellatus*).
P. H. CARPENTER. Trans. Linn. Soc. (Zoöl.), (2), vol. 2, 1879, p. 29 (*Comatula tessellata*).
—— "Challenger" Reports. Comatulae, 1888, p. 193 (*Antedon tessellata*).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1580 (*Antedon tessellata*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 356 (*Himerometra tessellata*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 7 (*Amphimetra* [?] *tessellata*).
—— Crinoids of the Indian Ocean, 1912, p. 282 (*Alecto tessellata*).

Remarks. — The type of this species is at Bamberg; it has not been examined by any one since MÜLLER. From the very short description it cannot be definitely assigned to any particular species.

Locality. — India.

Homalometra A. H. Clark.

1. *Homalometra denticulata* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 130, pl. 22, figs. 1, 2 (*Antedon denticulata*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, part 3, p. 349 (*Nanometra denticulata*).
—— Crinoids of the Indian Ocean, 1912, p. 113 (*Amphimetra denticulata*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 25 (*Amphimetra denticulata*).

Stat. 167. 2° 35'.5 S., 131 26'.2 E. 95 Metres. 1 Ex.

The centrodorsal is very thin, discoidal, with a broad, very slightly convex, dorsal pole 1.5 mm. in diameter which bears numerous very small scattered tubercles among which, about the border, are larger irregular flattened tubercles, frequently surrounded by a circle of the smaller ones, apparently indicating the location of obsolete cirrus sockets. The cirrus sockets are arranged in a single slightly irregular marginal row.

Cirri XIII, 27—29, 25 mm. to 27 mm. long, very slender, gradually and slowly tapering to a point, only slightly and irregularly curved. The first segment is very short, the second about twice as broad as long, the third from about as long as broad to half again as long as broad, the fourth or fifth and following about four times as long as broad, becoming slightly shorter (from two and one half to three times as long as broad) toward the end of the second third of the cirrus, and longer again terminally. The longer cirrus segments are very slightly constricted centrally; those in the outer third of the cirri have the ventral and dorsal profile more nearly straight. The terminal claw is very long and very slender, about as long as the preceding segment, with the tip more or less curved downward.

The proximal edge of the radials, adjacent to the centrodorsal, is bordered by a row of small rounded bead-like tubercles, and there are smaller and less conspicuous tubercles scattered over their surface in the angles of the calyx. The IBr_1 are very short, more than four times as broad as long; the IBr_2 (axillaries) are low triangular, twice as broad as long.

The IIBr series (only one present) is 4 (3 + 4). The ossicles of the IBr series and the first two brachials have slight lateral extensions, and are broadly "wall-sided" as far as the base of P_1.

The eleven arms are 90 mm. long. The first brachial is very short, about four times as broad as long, only slightly wedge-shaped; the second is irregularly quadrate, about three times as broad as the median length; the third and fourth form a syzygial pair which is remarkable for its extreme shortness, being about three times as broad as long, slightly longer inwardly than outwardly, the hypozygal oblong, the epizygal wedge-shaped; the next four brachials are nearly oblong, with the distal border produced; the following brachials are remarkably uniform, very short, slightly wedge-shaped, about four times as broad as the median length, in the middle of the arm becoming about three times as broad as long, and at the arm tip about as long as broad. When the arm is viewed from the side the dorsal profile of the brachials, though approximately straight, is seen to make a considerable angle with the axis of the arm so that the profile of the arm as a whole is very strongly serrate. The prominent distal edges of the brachials are very finely spinous.

P_1 is 7 mm. long with 22 segments, slender, becoming very delicate distally; the first segment is much broader than long, the following increasing in length and becoming about as long as broad on the eighth and twice as long as broad terminally; the second to fifth have a high carinate process, the crest of which is parallel with the longitudinal axis of the segments; the first bears a similar, but less marked process; the sixth bears a triangular keel proximally as high as the keel on the preceding segment but running to a point distally; the sixth and following segments increase in diameter from the proximal to the distal end, which makes the latter very prominent; the segments beyond the eighth are low triangular in section, with a more or less rounded dorsal ridge. P_2 is 9 mm. long with about 20 segments, similar to P_1 but slightly larger with proportionately slightly longer segments, these becoming about three times as long as broad distally; the second to fourth segments are carinate, like the second to fifth in P_1; the fifth has a triangular keel like the sixth in P_1; the second and following segments have the distal dorsal corner swollen and slightly produced. P_3 is 12 mm. long with 18 or 19 segments, much larger than the preceding; it tapers more rapidly in the first four segments than beyond, and remains rather stiff distally; the first segment is irregularly triangular, not quite twice as broad as long, the second is approximately oblong, about twice as broad as long, the third is slightly broader than long, the fourth is about one third again as long as broad; the following gradually increase in length, in the outer fourth of the pinnule becoming three times as long as broad or even longer; the first segment bears a dorsal tubercle; the second-fourth have a narrow straight edged carinate process; the fifth bears a narrowly carinate process in the proximal half; on the second there is a slight projection of the dorsal distal angle which rapidly increases in size, becoming on the fourth and following a very prominent, though narrow, projection of the distal dorsal angle involving about the distal fourth of the dorsal edge, which is armed with fine spines. P_4 is about 7 mm. long with 13 segments, and tapers more rapidly in the first four segments than subsequently; it resembles P_3 but is proportionately smaller with the projection of the distal dorsal angles of the segments much less marked and the proximal segments only very slightly carinate. P_5 is 6 mm. long with 13 segments which become about

as long as broad on the fourth and on the eighth and following from three to four times as long as broad, with the distal dorsal angles slightly produced. The distal pinnules are 8 mm. long with 17—19 segments most of which are about three times as long as broad, smooth and cylindrical, without produced or spinous distal ends.

In life this individual was banded light lavender and light yellow, the bands being from 3 mm. to 4 mm. in width, thus resembling strongly *Pectinometra flavopurpurea*; the colour in spirits is white.

IV. Family Stephanometridae A. H. Clark.

Genus **Stephanometra** A. H. Clark.

Key to the Species of the Genus Stephanometra.

a¹ Outer cirrus segments with long and prominent dorsal spines

b¹ 33—40 arms 110 mm. to 120 mm. long; 25—30 cirrus segments; first six pinnules enlarged, stiffened and spine-like, gradually decreasing in length beyond the second or third (India to the Malay Archipelago and the Philippine Islands) . . . . . *echinus* [1])

b² 16—24 arms 60 mm. to 70 mm. long; 20 cirrus segments; first three to five pinnules stiffened and spine-like (Singapore to the Philippine Islands and New Britain) . . . . . *tenuipinna*

a² Outer cirrus segments carinate dorsally, without dorsal spines

b¹ P_1 stiffened and spine-like, resembling P_2 but somewhat smaller; 12 arms 35 mm. long; 15 cirrus segments (Moluccas to Borneo). . *spinipinna*

b² P_1 slender, flexible, delicate and flagellate, much smaller and weaker than the enlarged and stiffened P_2

c¹ P_2 the only pinnule which is enlarged and stiffened

d¹ P_2 much enlarged and stiffened, usually more or less straight, ending distally somewhat abruptly in a strong stout point; it is composed of 11—15 (usually 12) segments, of which the fourth-fifth are typically markedly the longest (Andaman Islands to Singapore, the Philippines, the Malay Archipelago, New Caledonia, Fiji, and the Tonga and Caroline Islands) . . . . . *monacantha* [2])

d² P_2 somewhat less enlarged and stiffened, usually more or less strongly recurved, becoming very slender and delicate distally, though not flagellate; it is composed of 15—20 segments of which the fourth-fifth are not especially noticeable (Mada-

1) Synonym *Stephanometra coronata* A. H. Clark.

2) Synonyms *Antedon flavomaculata* Bell and *Himerometra acuta* A. H. Clark.

gascar, the Seychelles and Rodriguez to Ceylon and southern India; Lesser Sunda Islands and north Australia). . . . . *indica* [1])

c^2 P_3 and sometimes one or more of the following pinnules resembling P_2, though usually shorter

d^1 P_2 and P_3 the only pinnules which are enlarged, stiffened and spine-like (Red Sea) [?]; Ceylon to Singapore and New Guinea, and the Philippine, Caroline, Pelew, Admiralty, Solomon and Loyalty Islands) . . *spicata* [2])

d^2 P_2 to P_4 or P_5 enlarged, stiffened and spine-like (Philippines to Java, the Moluccas and the Solomon Islands) . . . . . *oxyacantha*

1. *Stephanometra echinus* (A. H. Clark).

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 218 (*Himerometra echinus*).
—— Proc. U. S. Nat. Mus., vol. 36, 1909, p. 639 (*Stephanometra coronata*).
—— The Crinoids of the Indian Ocean, 1912, p. 132 (*Stephanometra echinus*); p. 133, fig. 13, p. 134 (*Stephanometra coronata*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 19.

Stat. 40. Anchorage off Pulu Kawassang, Paternoster Islands. 12 Metres. 1 Ex.
Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 Metres. 1 Ex.

The specimen from Stat. 40 has 28 arms about 85 mm. long; the cirri are XVI, 22—24, 19 mm. long; the eighth or ninth is a transition segment; P_1 is 11 mm. long with 12 segments; P_2 is 12 mm. long with 11 segments; P_3 is 9 mm. long with 9 segments; P_4 is 7 mm. long with 9 segments; P_5 is 5 mm. long with 9 segments, slightly stiffened. The first four pinnules are all stiff and spine-like, and are enlarged in proportion to their length. The colour is dull whitish, with narrow bands of yellow brown on the arms and cirri.

From Stat. 99 there is a small specimen with 29 arms; it is a uniform dull light yellow in colour.

2. *Stephanometra oxyacantha* (Hartlaub).

Hartlaub. Nova Acta Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 55, pl. 3, figs. 35, 37 (*Antedon oxyacantha*).
A. H. Clark. Records of the Australian Museum, vol. 9, 1912, N° 1, p. 82.
Reichensperger. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 102 (*Stephanometra oxyacantha*).

Enkhuizen Island, near Batavia, Java. 4 Ex.
Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 Metres. 1 Ex.

1) H. L. Clark's record of *S. monacantha* from Maër Island, Torres Strait (Carnegie Institution of Washington Publication N° 212, 1915, p. 103) probably refers to this species.

2) Synonyms: *Antedon tuberculata* and *A marginata* P. H. Carpenter, and *Stephanometra stypacantha* H. L. Clark.

One of the specimens from Enkhuizen Island has 30 arms 135 mm. long and cirri XXXV, 24—25, 30 mm. long. P_1 is 11 mm. long with 20 segments, very slender and delicate; the outer segments are three times as long as broad. P_2 is 15 mm. long, stiff and spine-like, with 12 segments. P_3 is 14 mm. long with 11 segments, resembling P_2. P_4 is 10 mm. long with 11 segments, resembling P_3. P_5 is 7 mm. long with 9 segments, of the same character as the preceding. The following pinnules are short. P_2 is very slightly stouter than P_3. The other specimens are similar.

The example from Stat. 99 has 31 arms about 110 mm. long; the cirri are XXIV, 24—29 (usually 24—26), 25 mm. to 30 mm. long; P_1 is 12 mm. long, very delicate, with 20 segments of which the outer are three times as long as broad. P_2 is 15 mm. long, stiff and spine-like with 13 segments. P_3 is 14 mm. long with 12 segments, resembling P_2; P_4 is 9 mm. long with 10 segments, resembling P_2 and P_3, but proportionately smaller; P_5 is 6 mm. long with 9 segments, of the same character as the preceding. P_6 is soft and delicate, 4.7 mm. long with 9 segments; the following pinnules are similar.

3. *Stephanometra spicata* (P. H. Carpenter).

P. H. Carpenter. Notes from the Leyden Museum, vol. 3, 1881, p. 190 (*Antedon spicata*).
Bell. Proc. Linn. Soc. New South Wales, vol. 9, 1884, p. 497 (*Antedon spicata*).
P. H. Carpenter. "Challenger" Reports. The Comatulae, p. 230, pl. 40 (*Antedon marginata*); p. 232, pl. 45, figs. 2, 3 (*Antedon tuberculata*).
A. H. Clark. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 169 (*Stephanometra marginata*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 183.
—— Records of the Australian Museum, vol. 9, 1912, N° 1, p. 84.
—— Proc. U. S. Nat. Mus., vol. 43, 1912, p. 396 (*Stephanometra tuberculata*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 20 (*Stephanometra tuberculata*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 28 (*Stephanometra tuberculata* and *S. marginata*).
H. L. Clark. Carnegie Institution of Washington Publication N° 212, 1915, p. 103 (*Stephanometra stypacantha*).

Stat. 99. 6° 7'.5 N., 120° 26' E. 16—23 Metres. 1 Ex.

This specimen has 20 arms 85 mm. long; the cirri are XXV, 22—23, 20 mm. long; P_2 is comparatively short, 11 mm. long with 15 segments; P_3 is 8 mm. long with 13 or 14 segments.

4. *Stephanometra spinipinna* (Hartlaub).

Hartlaub. Nova Acta Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 61, pl. 4, figs. 42, 44 (*Antedon spinipinna*).

Stat. 81. Pulu Sebangkatan, Borneo Bank, 34 Metres. 1 Ex.
Stat. 89. Pulu Kaniungan Ketjil. 11 Metres. 1 Ex.

The specimen from Stat. 81 has 31 arms about 90 mm. long; the cirri are XXIV, 22—23, 20 mm. long; P_1 is 10 mm. long with 18 segments; P_2 is 12 mm. long with 12 segments; P_3 is 10 mm. long with 11 segments; P_4, which is of the same character as the preceding, is 8 mm. long with 10 segments.

The individual from Stat. 89 has 25 arms about 80 mm. long; the cirri are XXIII, 22—23, 15 mm. to 20 mm. long; P_1 is 11 mm. long with 20 segments of which the first two are about as long as broad, the third is longer than broad, and the remainder much elongated; the pinnule is slender, but very stiff; P_2 is 11 mm. to 12 mm. long, stouter than P_1, with 13 segments; P_3 is 9 mm. long with 10 segments; P_4 which resembles the preceding pinnules, is 5 mm. long with 9 segments.

5. *Stephanometra monacantha* (Hartlaub).

LÜTKEN. Catalogue Mus. Godeffroy, vol. 5, 1874, p. 190 (*Antedon protectus*, part).
—— in Carpenter, Trans. Linn. Soc. (Zoöl.), series 2, vol. 2, p. 19 (*Antedon protectus*, part).
HARTLAUB. Nova Acta Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 59, pl. 3, fig. 38 (but not fig. 33) (*Antedon monacantha*; the specimen mentioned from Torres Straits represents *S. indica*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 400 (*Antedon flavomaculata*).
A. H. CLARK. Bull. Mus. Com. Zoöl. vol. 51, 1908, N° 8, p. 242 (*Himerometra acuta*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 168.
—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 220 (*Himerometra monacantha*).
—— Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 252.
HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 412 (*Antedon monacantha*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 21.
—— The Crinoids of the Indian Ocean, 1912, p. 136, fig. 14, p. 137.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 29.

Stat. 89. Pulu Kaniungan Ketjil. 11 Metres. 11 Ex.
Stat. 96. Southeastern side of the Pearl Bank, Sulu Archipelago. 15 Metres. 1 Ex.
Stat. 250. Anchorage off Kilsuin, western coast of Kur Island. 20—45 Metres. 1 Ex.

All of the specimens from Stat. 89 are small. One has 15 arms 40 mm. long; the cirri have 17 segments of which the proximal are proportionately more slender than in adults; P_2 is proportionately more slender than in the adults, with 10 segments, which are proportionately longer, and is slightly recurved; P_3 resembles the following pinnules. Another has 20 arms 70 mm. long; the cirri are about 16 mm. long with 19 segments; P_2 is 8 mm. long with 11 segments; P_3 resembles P_4. A third has 18 arms 65 mm. long; the cirri are 15 mm. long with 19 segments; P_2 is 9 mm. long with 11 segments. Of the remaining specimens three have 15 arms and four have 14 arms; in one of the latter P_2 has 12 segments. One individual not enumerated above is small and much broken.

The example from Stat. 96 has 17 arms, and is undergoing adolescent autotomy; P_2 has 9 segments of which the first two are about as long as broad and the third is twice as long as broad.

The specimen from Stat. 250 (which was dredged at 27 Metres) has 14 arms 55 mm. long; the cirri are 11 mm. long; P_2 is 6.5 mm. long with 10—12 (usually 11) segments.

Judging from the evidence afforded by the youngest specimens the proportions of the lower pinnules in the ten-armed stage are just as in the adults, but P_2 is more slender, somewhat recurved, with more prominent articulations.

6. *Stephanometra indica* (E. A. Smith).

E. A. Smith. Ann. and Mag. Nat. Hist., series 4, vol. 17, 1876, p. 406 (*Comatula indica*).
—— Phil. Trans. Roy. Soc., vol. 168, 1879, p. 564, pl. 51, figs. 3, 3*a*—*b* (*Comatula indica*).
Bell. Proc. Zoöl. Soc. London, 1888, pp. 384, 387 (*Antedon palmata*, part).
Hartlaub. Nova Acta der Ksl. Leop.-Carol. deutschen Akademie der Naturforsch., vol. 58, 1891, N° 1, p. 59 (*Antedon monacantha*, part; specimen from Torres Strait).
Thurston. Madras Government Museum Bulletin, 1894, N° 1, p. 28; N° 2, p. 114 (*Antedon palmata*, part).
Bell. in Gardiner, Fauna and Geography of the Maldive and Laccadive Archipelagoes, vol. 1, 1902, part 3, p. 225 (*Actinometra maculata*, part).
—— Trans. Linn. Soc. (Zoöl.), series 2, vol. 13, 1909, part 1, p. 20 (*Antedon palmata*).
A. H. Clark. Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 252.
—— Proc. U. S. Nat. Mus., vol. 40, 1911, p. 26.
—— The Crinoids of the Indian Ocean, 1912, p. 135; p. 136 (under *S. monacantha*, specimens from off northeastern Ceylon).
Reichensperger. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 102 (*Stephanometra monacantha*).
A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 29.
H. L. Clark. Carnegie Institution of Washington Publication N° 212, 1915, p. 103 (*Stephanometra monacantha*).

Stat. 301. 10° 38′ S., 123° 25′.2 E. 22 Metres. 1 Ex.

In this specimen the 20 arms are 115 mm. long; the flat dorsal pole of the centrodorsal is 2 mm. in diameter; the cirri are XXXIII, 20—21, 20 mm. long; P_2 is 15 mm. long with 15—16 segments of which the fourth and fifth are the longest; on the inner arms P_2 is 12 mm. long, though composed of the same number of segments. P_3 is relatively slender, much less spine-like than usual, more flexible basally, becoming very slender distally; the three basal segments are about as long as broad, the fourth about one third again as long as broad; the remaining segments are elongated.

This specimen appears to be identical with Hartlaub's specimen of *monacantha* from Torres Strait. It also agrees with specimens of *indica* at hand from Ceylon, and with others from Madagascar which I have examined, though the size is somewhat greater.

There can be little doubt that the specimen taken by Dr. H. L. Clark at Maër Island, Torres Strait, and recorded by him as *S. monacantha*, belongs to this species.

V. Family Mariametridae A. H. Clark.

Key to the Genera of the Family Mariametridae.

a¹ Cirri very large and long, with more than 40 (usually 50—80) segments
  b¹ P_1 on the outer arms greatly elongated and flagellate, more than five times as long as the following pinnules; division series very narrow, very deep dorsoventrally, and very widely separated . . . . . **Pontiometra**
  b² P_1 only very slightly, if at all, longer than P_2, and of the same character; division series nearly or quite in apposition laterally through the extension of their ventrolateral borders . . . . . **Oxymetra**

a^2 Cirri short or of moderate length, with less than 40 segments

b^1 P_2 and P_3 similar, and of equal length . . . . . **Liparometra**

b^2 P_2 and P_3 of unequal length

c^1 P_2 markedly longer, and more or less stouter, than P_3 or P_1 . . **Lamprometra**

c^2 P_3 markedly longer than P_2, which in turn is markedly longer than P_1

d^1 lateral portions of the dorsal surface of the division series smooth; division series never carinate, and never with a narrow dark median line; disk naked . . . . . **Dichrometra**

d^2 lateral portions of the dorsal surface of the division series with a prominent granular, tubercular or spinous ornamentation; a faint median carination or a narrow dark median line on the division series and arm bases, both often occurring together; disk covered, usually completely, with calcareous plates . . **Mariametra**

Pontiometra A. H. Clark.

1. *Pontiometra andersoni* (P. H. Carpenter).

LÜTKEN. Catalogue Museum Godeffroy, vol. 7, 1879, p. ? (*Antedon polypus*, nomen nudum).
BELL. Proc. Zoöl. Soc. London, 1887, p. 140 (*Antedon* sp.).
—— Proc. Zoöl. Soc. London, 1888, p. 387, footnote (*Antedon andersoni*, nomen nudum).
P. H. CARPENTER, Journ. Linn. Soc. (Zoöl.), vol. 21, 1889, p. 306, pl. 26, figs. 1—5; pl. 27, fig. 8 (*Antedon andersoni*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 78 (*Antedon andersoni*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 212.
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 165.
—— Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 252.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 21.
—— Proc. U. S. National Museum, vol. 43, 1912, p. 397.
—— The Crinoids of the Indian Ocean, 1912, p. 138.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 103.

Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 Metres. 1 Ex.

A medium sized specimen with 53 arms about 140 mm. long was secured at this station.

Oxymetra A. H. Clark.

Key to the Species of the Genus Oxymetra.

a^1 Cirrus segments long, the longest about twice as long as broad, the distal about as long as broad; 50 (49) arms 150 mm. long; cirri 55 mm. to 70 mm. long with 69—78 segments (Java Sea) . . . . . *tenuicirra*

a^2 Cirrus segments shorter, the longest but little longer than broad, the distal twice as broad as long, or even broader

b[1] the first four pairs of pinnules very stiff, and spine-like; 50 (51) arms 115 mm. long; the extra axillaries are external, so that the arms are arranged in 3, 2, 2, 3 order; the cirri are XXX—XXXV, 50—60, 40 mm. long (Philippine Islands) . . . . . *erinacea*

b[2] the proximal pinnules, though stiffened, are not spine-like, ending in a delicate, more or less flagellate tip; 40 arms

c[1] first four or five pairs of pinnules stiffened and elongated; P_1 about as long as P_2, which is markedly longer than P_3; 60—80 cirrus segments of which those in the outer half of the cirri bear small dorsal spines (Philippines and New Britain) . . . . . *finschii* [1])

c[2] first six or seven pairs of pinnules stiffened and elongated; P_1 markedly shorter than P_2 and P_3, which are of the same length and character; 47—66 cirrus segments, of which the outer three fourths bear prominent dorsal spines (Andaman Islands to the Philippines) . . . *aranea* [2])

1. *Oxymetra tenuicirra* (A. H. Clark).

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 32 (*Selenemetra tenuicirra*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 22, in text (*Selenemetra tenuicirra*).

Stat. 320. 6° 5′ S., 114° 7′ E. 82 Metres. 1 Ex.

This species is very closely related to *O. finschii* from which it differs chiefly in having more slender cirri with much longer distal segments, which are nearly or quite as long as broad instead of twice as broad as long or even broader as in *O. finschii*, and also longer proximal segments the longest of which are about twice as long as broad instead of only slightly, if at all, longer than broad.

The single specimen has 49 arms 150 mm. long; each IIBr series bears two IIIBr series, of which the inner bears an internal IVBr series, so that there are 10 arms to each ray arranged in 2, 3, 3, 2 order.

The cirri are XXXV, 69—78, 55 mm. to 70 mm long, much more slender than those of *O. finschii*.

P_1 is 11 mm. long with 20—21 segments which become about as long as broad on the fifth or sixth and twice as long as broad distally; P_2 is 12 mm. long with 22 segments, resembling P_1. P_3 is 10 mm. long with 18 segments. P_4 is 7.5 mm. long with 13 segments; the distal taper is more marked than in P_3. P_5 is 7 mm. long with 13 segments, slightly more slender than P_4, especially in the distal portion. The distal pinnules are 8 mm. long with 17 segments.

1) Synonym *Himerometra gracilipes* A. H. Clark.
2) Synonym *Selenemetra viridis* A. H. Clark.

Lamprometra A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 26, 1913, p. 143.

Key to the Species of the Genus Lamprometra.

a[1] P_2 very long, rather stiff, and very stout, though tapering gradually to a delicate and more or less flagellate tip; on the outer arms of each IBr series (or on the outer arms of each IIBr series if the specimen be very large) P_2 is very much larger and longer than elsewhere; P_2 is usually much larger and longer than P_1 or P_3, and the latter is usually but slightly longer than P_4 (Ceylon to China, Oceania and northeastern Australia, reaching Hong Kong, the Philippine, Caroline, Marshall and Hawaiian Islands, Fiji, Tonga and New Caledonia) . . . . . *protectus* [1])

a[2] P_2, though much elongated and somewhat stiffened, is slender and but slightly enlarged, resembling P_1 in character but of greater length

b[1] basal segments of the proximal pinnules not carinate; P_3 more nearly resembling P_2 than P_4 (Red Sea, and eastward to Muscat) . . *palmata* [2])

b[2] basal segments of the proximal pinnules strongly carinate; P_3 more nearly resembling P_4 than P_2 (Australia, except the southern coast, and New Guinea) . . . . . *gyges* [3])

1. *Lamprometra protectus* (Lütken).

J. Müller. Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 261 (*Comatula* [*Alecto*] *palmata*, part).

Dujardin et Hupé. Hist. nat. des Zoophytes. Échinodermes, 1862, p. 208 (*Comatula dividua* and *C. polyactinis*).

Lütken. Catalogue Mus. Godeffroy, vol. 5, 1874, p. 190 (*Antedon protectus*).

—— in P. H. Carpenter, Trans. Linn. Soc. (Zoöl.), series 2, vol. 2, 1879, p. 19 (*Antedon protectus*).

P. H. Carpenter. Notes from the Leyden Museum, vol. 3, 1881, p. 187 (*Antedon brevicuneata*); p. 189 (*Antedon laevicirra*); p. 192 (*Antedon protecta*).

—— Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 504 (*Antedon aequipinna*); p. 505 (*Antedon imparipinna*).

Bell. Proc. Zoöl. Soc. London, 1888, pp. 384, 387 (*Antedon palmata*).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 225 (*Antedon protecta*); p. 233, pl. 45, fig. 1 (*Antedon conjungens*); p. 235, pl. 47, figs. 1—3 (*Antedon similis*); p. 236, pl. 48, figs. 1, 2; pl. 49, figs. 3, 4 (*Antedon occulta*).

Bell. Willey's Zoölogical Results, vol. 2, 1889, p. 133 (*Antedon indica*).

P. H. Carpenter. Journ. Linn. Soc. (Zoöl.), vol. 21, 1889, p. 311 (*Antedon conjungens*).

Hartlaub. Nachr. Ges. Göttingen, Mai 1890, p. 176 (*Antedon lepida*); p. 180 (*Antedon protecta*); p. 181 (*Antedon amboinensis*).

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1) Synonyms *Comatula dividua* and *C. polyactinis* Dujardin et Hupé, *Antedon aequipinna*, *A. brevicuneata*, *A. conjungens*, *A. imparipinna*, *A. laevicirra*, *A. occulta* and *A. similis* P. H. Carpenter, *Antedon amboinensis*, *A. lepida* and *A. subtilis* Hartlaub; *Antedon okelli* Chadwick; *Himerometra heliaster* A. H. Clark; and *Lamprometra brachypecha* and *L. callipecha* H. L. Clark.

2) Synonyms *Comatula leucomelas* Leuckart, *C. scita* Dujardin et Hupé, and *Antedon klunzingeri* Hartlaub.

3) Synonym *Antedon tenera* Hartlaub.

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 49 (*Antedon palmata*, specimens other than those from the Red Sea); p. 63 (*Antedon imparipinna*); p. 68, pl. 3, fig. 31; pl. 4, fig. 39 (*Antedon brevicuneata*).
THURSTON. Madras Government Museum Bulletin, 1894, N° 1, p. 28; N° 2, p. 114 (*Antedon palmata*).
HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N° 4, p. 151 (*Antedon subtilis*).
CHADWICK. Report Ceylon Pearl Oyster Fisheries, part 2, 1904, Suppl. Report XI, p. 155, plate, figs. 3—5 (*Antedon okelli*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, p. 356 (*Himerometra helianthus*).
—— Bull. Mus. Comp. Zoöl. vol. 51, 1908, N° 8, p. 242 (*Himerometra heliaster*).
—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 220 (*Himerometra protectus*).
—— Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 367 (*Dichrometra protectus* and *D. palmata*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 172 (*Dichrometra protectus*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 186 (*Dichrometra protectus* and *D. laevicirra*).
—— Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 253 (*Dichrometra protectus*).
—— Records of the Australian Museum, vol. 9, 1912, N° 1, p. 84 (*Dichrometra protectus*).
—— Records of the Indian Museum, vol. 7, 1912, part 3, N° 26, p. 269 (*Dichrometra protectus*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 24 (*Dichrometra protectus*).
—— Proc. U. S. National Museum, vol. 43, 1912, p. 397 (*Dichrometra protectus*).
HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 409 (*Antedon brevicuneata*); p. 410 (*Antedon similis*).
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 143, fig. 17, p. 145; fig. 18, p. 146 (*Dichrometra protectus*); p. 147 (*D. laevicirra* and *D. similis*); p. 148 (*D. tenera*, part, and *D. palmata*, part); p. 149 (*D. subtilis* and *D. heliaster*); p. 150 (*D. occulta*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 31 (*Lamprometra protectus*).
REICHENSPERGER. Abhandl. d. Senk. naturforsch. Gesellsch., vol. 35, 1913, part 1, p. 103 (*Dichrometra palmata*); p. 104 (*Dichrometra protectus*).
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 104 (*Lamprometra brachypecha* and *L. callipecha*).

Stat. 78. Lumu Lumu Shoal, Borneo Bank. 34 Metres. 9 Ex.
Stat. 79b. Pulu Kabala Dua, Borneo Bank. 22 Metres. 2 Ex.
Stat. 81. Pulu Sebangkatan, Borneo Bank. Reef. 3 Ex.
Stat. 89. Pulu Kaniungan Ketjil. 11 Metres. 1 Ex.
Stat. 96. Southeastern side of the Pearl Bank, Sulu Archipelago. 15 Metres. 3 Ex.
Stat. 99. 6° 7'.5 N., 120° 26' E. (Anchorage off North Ubian). 16—23 Metres. 1 Ex.
Stat. 115. Eastern side of Pajunga Island, Kwandang Bay. Reef. 1 Ex.
Stat. 125. Anchorage off Sawan, Siau Island. 27 Metres. 1 Ex.
Stat. 164. 1° 42'.5 S., 130° 47'.5 E. 32 Metres. 1 Ex.
Stat. 174. Waru Bay, northern coast of Ceram. Reef. 2 Ex.
Stat. 193. Sanana Bay, eastern coast of Sula Besi. 22 Metres. 1 Ex.
Stat. 209. Anchorage off the south point of Kabaëna Island. 22 Metres. 1 Ex.
Stat. 231. Amboina. Reef. 2 Ex.
Stat. 248. Anchorage off Rumah Lusi, northern point of Tiur Island. Down to 54 Metres. 1 Ex.
Stat. 279. Rumah Kuda Bay, Roma Island. 36 Metres. 1 Ex.
Stat. 303. Haingsisi. Reef. 4 Ex.

The details of the specimens from Stat. 78 are as follows: one has 21 arms 75 mm. long; P_2 on the outer arms is very large; all of the proximal pinnules are considerably enlarged;

a second has 21 arms 70 mm. long; P_1 is greatly enlarged on the outer side of the IBr series, where it stands out with great prominence; the others are similar; one has 26 arms, two have 25, and one has 22; the remaining three are small.

From Stat. 79[b] comes an example with 28 arms about 60 mm. long, and another smaller.

Stat. 81 (reef) yielded a typical 40 armed specimen with the arms 95 mm. long; P_2 is especially stout, and very stiff; there are four large P_2 on each ray; a similar specimen has 30 arms 75 mm. long; the third is smaller.

The single individual from Stat. 89 has 40 arms 85 mm. long and cirri XXVIII, 23—24, 20 mm. long; the outermost pinnules on the rays are markedly longer than the others; P_2 is 15 mm. long with 30—32 segments.

Of the three specimens from Stat. 96 one has 30 arms about 60 mm. long, one 27 arms about 60 mm. long, and the third about 30 arms about 65 mm. long; the last is deep purple, with the dorsal pole of the centrodorsal and the dorsal side of the proximal half of the cirri white. In all three the enlarged lower pinnules, though long, are rather slender.

The example from Stat. 99 has 30 arms 60 mm. long; the lower pinnules are very slender.

From the reef at Stat. 115 comes a magnificent specimen with 40 arms 110 mm. long; the division series are entirely and rather widely separated; the dorsal pole of the centrodorsal is very slightly concave, 4.5 mm. in diameter; the cirri are XIX (with numerous rudimentary), 26—27, 20 mm. long; the distal segments bear slight dorsal tubercles; P_2 is 16 mm. long, very stout, but tapering evenly distally to a delicate tip, with 29 segments; the pinnules on the outer side of each IIBr series are greatly enlarged instead of only those on the outer side of each IBr series as in smaller examples.

The individual from Stat. 125 has 20 arms 80 mm. long; one IBr series does not divide further; P_2 is greatly enlarged on the outer side of the IBr series.

Stat. 164 yielded a small and badly broken specimen.

Of the two from Stat. 174 (reef) one has 39 arms 75 mm. long, the other 26 arms 65 mm. long; in both P_2 is only enlarged on the outer side of the IBr series.

The specimen from Stat. 193 is similar to those from Stat. 279.

From the reef at Stat. 209 there is a 20 armed specimen which agrees perfectly with others at hand from the Marshall Islands.

The example from Stat. 248 has 40 arms 120 mm. long; P_2 is greatly enlarged on the outer side of each IBr series, and considerably enlarged on the inner side of each IIBr series, but small elsewhere.

The three from Stat. 279 are similar; one has 39 arms about 100 mm. long; P_2 is rather slender, greatly enlarged on the outer side of each IBr series, and nearly as large on the innermost side of each IIBr series; the others have 37 and 40 arms respectively.

The magnificent specimen from Amboina has 40 arms 125 mm. long; P_2 is 22 mm. long with 40 segments and is greatly enlarged on all the arms, though considerably larger on the outer arms than on the inner. There is also from Amboina a smaller individual with 40 arms 80 mm. long.

The details of the four from the reef at Haingsisi are as follows: about 40 arms 75 mm.

long; P_2 is much enlarged on the outer side of the IBr series, and considerably enlarged on the innermost side of the IIBr series; 22 arms 75 mm. long; all of the P_2's are enlarged, more so than in the preceding; one with 23 arms 75 mm. long, similar to the first; one with 30 arms 65 mm. long, also similar to the first.

Liparometra A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 26, 1913, p. 143.

Key to the Species of the Genus Liparometra.

a¹ More than 30 (usually 32—36) cirrus segments
  b¹ P_2 and P_3 half again as long as P_1; cirri long, rather slender, with prominent spines on the outer segments (Moluccas to northern Australia) . *articulata*
  b² P_2 and P_3 twice as long as P_1; cirri rather short, and stout, the outer segments with very slight, or no, spines (southern Japan) . . . . *grandis*
a² 25—30 cirrus segments (Tonga Islands) . . . . . *regalis*

1. *Liparometra articulata* (J. Müller).

J. MÜLLER. Abhandl. d. k. preuss. Akad. d. Wiss., 1847 (1849), p. 263 (*Comatula* [*Alecto*] *articulata*).
BELL. Report Zoöl. Coll. H. M. S. "Alert", 1884, p. 160, pl. 12, figs. A, A*a* (*Antedon articulata* and *Antedon reginae*).
A. H. CLARK. Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 253 (*Dichrometra articulata*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, p. 440 (*Dichrometra articulata*); p. 441 (*Dichrometra reginae*), and p. 443 (*Dichrometra articulata* and *D. reginae*).
—— The Recent Crinoids of Australia, 1911, p. 770 (*Dichrometra articulata* and *D. reginae*).
—— Crinoids of the Indian Ocean, 1912, p. 150 (*Dichrometra reginae*) and p. 152 (*Dichrometra articulata*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 31.
—— Internationale Revue der gesamten Hydrobiologie und Hydrographie, 1915, p. 223 (*Dichrometra articulata*).

Stat. 49ª. 8° 23′.5 S., 119° 4′.6 E. 69 Metres. 2 Ex.

Both of the specimens are much broken. The better may be described as follows:

The centrodorsal is low hemispherical, 5 mm. in diameter at the base; the small dorsal pole is strongly concave, 1 mm. diameter; the cirrus sockets are arranged in three closely crowded irregular rows.

The cirri are XXVII, 36—39, 30 mm. to 35 mm. long; the longest proximal segments are from slightly longer than broad to about one third again as long as broad; prominent, though small, dorsal spines are developed from the twelfth-fourteenth (usually fourteenth) segment onward.

The division series are in close lateral contact through rather broad lateral extensions which are straight edged and sharply flattened.

There are 41 arms, all the IIIBr series and one IVBr series (external) being developed. P_1 is 8 mm. long with 21 segments, resembling P_2, but with the outer segments not

quite so long. P_a is 8 mm. long with 21 segments which, gradually increasing in length, become as long as broad on the third and on the eighth and following twice as long as broad; the pinnule is very slender and delicate. P_2 is 12 mm. long with 24 segments, and is exactly like P_3. P_3 is very slender, 12 mm. long with 21 segments of which the first is very short, the second is nearly as long as broad, the third is slightly longer than broad, and the following slowly increase in length so that the ninth and following are nearly two and one half times as long as broad. P_4 is 6 mm. long with 15 segments, not quite so stout basally as P_3 and tapering more rapidly. The proximal pinnules, though very slender, are all slightly stiffened.

The disk is completely covered with a pavement of rather small irregular plates.

The colour is light gray, with very narrow black bands at the articulations; the cirri are white, the distal half light purple ventrally, this increasing in extent distally.

The second specimen has 23 arms; the division series are broad and sharply flattened laterally; the distal ends of the ossicles of the division series and of the brachials are everted, producing a curiously rough appearance. The disk is completely covered with small rounded calcareous plates.

It is quite possible that *L. regalis* is really the young of this species.

Dichrometra A. H. Clark.

Key to the Species of the Genus Dichrometra.

a[1] Distal cirrus segments smooth dorsally, or with a slight dorsal carination, slightly broader than long; about 20 arms (southern Japan) . . . . . *döderleini* [1]

a[2] Distal cirrus segments bearing dorsally tubercles or spines

b[1] distal cirrus segments much longer than broad, bearing a prominent spine in the centre of the dorsal surface; about 20 arms (Java Sea). . . . *tenuicirra*

b[2] distal cirrus segments broader than long, usually very much so; 29—50 arms

c[1] the distal cirrus segments, which are not greatly broader than long, bear obsolete dorsal tubercles; P_4 is about as long as P_2; 40 arms (Moluccas) *bimaculata*

c[2] the distal cirrus segments, which are much broader than long, bear prominent dorsal spines

d[1] synarthrial tubercles prominent, though swollen and broadly rounded, and the lower brachials slightly swollen, so that the proximal portion of the animal presents a rugged and rugose appearance; P_4 about as long as, or longer than, P_2; elongated proximal pinnules with the component segments short, in large specimens slightly longer than broad, in small specimens not becoming twice as long as broad until at least the middle of the pinnule (Singapore and the Malay Archipelago to Hong Kong, the Pelew and the Admiralty Islands. . . . . *flagellata* [2]

1) Synonym *Antedon stylifer* A. H. Clark.

2) Synonyms *Alecto elongata* J. Müller and *Antedon pulcher* Lütken.

d^2 arm bases perfectly smooth; synarthrial tubercles, if present, narrow and conical; P_4 much shorter than P_2; elongated proximal pinnules more slender, with the component segments more elongated, beyond the seventh to the tenth twice as long as broad, and distally three times as long as broad

e^1 narrow and conical synarthrial tubercles present; P_3 2 mm. to 3 mm. longer than P_2; proximal pinnules stiff and wiry; habit robust; 45—47 arms (southern Japan) . . . . . *gotoi*

e^2 no synarthrial tubercles; P_3 0.5 mm. to 1.5 mm. longer than P_2; proximal pinnules delicate; habit slender and delicate; less than 42 arms

f^1 34—42 arms 110 mm. to 120 mm. long; cirri 30 mm. long with 29—35 (usually 33) segments; P_2 and P_3 with 31—34 segments; division series and arms as far as the third brachial thickly sprinkled with minute white dots (east coast of India) . *ciliata*

f^2 29 arms about 85 mm. long; cirri 15 mm. to 18 mm. long with 23—29 segments; P_2 and P_3 with 22—25 segments; division series and arm bases without white dots (southeastern Africa and Madagascar) . . . . . *afra*

1. *Dichrometra tenuicirra* A. H. Clark.

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 34.

Stat. 318. 6° 36′.5 S., 114° 55′.5 E. 88 Metres. 1 Ex.
Stat. 320. 6° 5′ S., 114° 7′ E. 82 Metres. 25 Ex.

The centrodorsal is low hemispherical with very sloping sides; the dorsal pole is slightly convex, flat, or very slightly concave, 1.5 mm. to 2.5 mm. in diameter; the cirrus sockets are arranged in two, or in two and a partial third, irregular and crowded marginal rows.

The cirri are XIX—XXVIII, 25—28 (usually 26), 20 mm. to 25 mm. long, slender and delicate; the tenth-twelfth (usually the twelfth) is a more or less marked transition segment; the first segment is very short, the second twice as broad as long, the third slightly broader than long, the fourth from half again to twice as long as the median diameter, the fifth from two to two and one half times as long as broad; the following to the ninth, tenth or eleventh are similar; the remainder are slightly shorter, about half again as long as broad; the tenth-twelfth and following bear prominent triangular median spines; after one or two segments these spines occupy about half of the mid-dorsal line; the anterior (distal) margin stands out vertically, and is from one half to one third as long as the recumbent side; the hypothenuse, from the apex of the spine to the proximal base, is straight, but its proximal end may be marked by a slight tubercle, or the hypothenuse may be slightly concave, leading from the distal spine

Fig. 5.
Lateral view of a cirrus from a specimen of *Dichrometra tenuicirra* from Stat. 320. × 2. (Courtesy of the U. S. National Museum).

to a smaller blunt proximal tubercle; the spines change but little distally, their bases becoming slightly shorter and their apices consequently sharper, and the hypothenuse straight; the opposing spine is longer than the spines on the preceding segments and more slender, median or submedian, nearly or quite erect, nearly or quite equal to the diameter of the penultimate segment in height; the terminal claw is longer than the penultimate segment, very long and slender, slightly and evenly curved; the longer earlier segments have slightly enlarged ends; this becomes less in the spiniferous distal segments, though it is traceable quite to the penultimate.

The division series and arms resemble those of *D. flagellata*, but are much more slender and delicate; the division series and first brachials may be well separated, or they may be in lateral contact; they are usually not quite in apposition, though they have straight lateral edges which are usually slightly swollen; the characteristic rugose appearance of *D. flagellata*, due to the low, though prominent synarthrial and articular tubercles is reflected in a delicate and modified form.

The arms are 16—23, 70 mm. to 80 mm. long.

P_1 is from 6.0 mm. to 6.5 mm. long with 15—18 segments of which the first is short, the second nearly as long as broad, the third about as long as broad, and the seventh or eighth and following slightly longer than broad. P_2 is 7 mm. long with 22 segments of which the first is short, the second about as long as broad, the third slightly longer than broad, the seventh or eighth and following half again as long as broad, becoming twice as long as broad terminally; the pinnule is very slightly stouter basally than P_1, but tapers less rapidly and more gradually, and is less flagellate distally. P_3 is 9 mm. long with 23 segments, resembling P_2 but proportionately stouter. P_4 is 8 mm. long with 20 segments, resembling P_3; the second-fourth segments are sometimes very slightly enlarged. P_5 is 4.5 mm. long with 14 segments, of the same character as P_4 but proportionately smaller. P_6 is 4.2 mm. long with 13 segments, similar to P_5. P_7 is 3.7 mm. long with 12 segments, similar to P_6. The following pinnules are of about the same length and stoutness, becoming weaker and more delicate distally. The distal pinnules are 6 mm. long, very slender, with 18—19 segments.

In nearly every detail of its structure this species agrees with *D. flagellata*; with the specimen of the latter which served MÜLLER as the type of his *Alecto elongata* the agreement is especially close, in the number of cirri, the number of cirrus segments, the number of the cirrus segment which bears the first dorsal spine, the proportions of the lower pinnules, and the number of their component segments. But the great slenderness of the cirri, which have greatly elongated distal segments serve easily to distinguish it.

2. *Dichrometra flagellata* (J. Müller).

J. MÜLLER. Archiv für Naturgesch., 1841, I, p. 145 (*Alecto flagellata*); p. 146 (*Alecto elongata*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N⁰ 1, p. 71, pl. 4, fig. 47 (*Antedon elongata*); p. 73, pl. 4, fig. 45 (*Antedon flagellata*).
A. H. CLARK. Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 172.
—— Notes from the Leyden Museum, vol. 33, 1911, p. 184.
—— Crinoids of the Indian Ocean, 1912, p. 150.

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 22.
—— Proc. U. S. Nat. Mus., vol. 43, 1912, p. 398.
—— Proc. Biol. Soc. Washington, vol. 26, 1913, p. 181.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 30.

Stat. 43. Anchorage off Pulu Sarassa, Postillon Islands. Up to 36 Metres. 1 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 1 Ex.
Stat. 213. Saleyer. 1 Ex.
Stat. 250. Anchorage off Kilsuin, western coast of Kur Island. 27 Metres. 1 Ex.

The specimen from Stat. 43 has the cirri XXI, 27—28, 20 mm. to 21 mm. long; the longest segments are about one third again as long as broad; the short distal segments are only slightly broader than long; dorsal spines, which are somewhat smaller than in specimens at hand from Singapore, are developed from the eighth or ninth onward. The 14 arms are 115 mm. long; only one (external) IIIBr series is present. P_1 is 8 mm. long with 28 segments. P_2 is 11.5 mm. long with 27 segments. P_3 is 15 mm. to 17.5 mm. long with 30—38 segments. P_4 is 9 mm. long with 20 segments on arms arising from a IIBr axillary, and 12.5 mm. long with 27 segments on arms arising from a IIIBr axillary; in the latter case it resembles P_3. The colour is deep purple.

The individual from Stat. 144 has 18 arms 90 mm. long; the longest cirri are 16 mm. long with 22—24 segments, of which the ninth or tenth and following bear dorsal spines.

The example from Stat. 250 has 20 arms 115 mm. long, all of the IIBr series being present; the cirri are XXIV, 24—25, 18 mm. long; dorsal spines are developed from the tenth or eleventh segments. P_1 is 4.5 mm. to 6.0 mm. long. P_2 is 7.5 mm. to 9.5 mm. long with 25 segments. P_3 is 9.0 mm. to 11.5 mm. long with 21 segments. P_4 is 6.0 mm. to 6.5 mm. long with 16 segments. The colour is whitish with broad, frequent and regular bands of purple on the arms which become more closely crowded distally so that the outer portion of the arms is purple with narrow white bands.

The large specimen from Saleyer has 40 arms about 100 mm. long, and cirri XXII, 29—30, 27 mm. long. It agrees very well with the type at Leyden.

Mariametra A. H. Clark.

Key to the Species of the Genus Mariametra.

a[1] Distal cirrus segments much broader than long, bearing long and sharp dorsal spines

b[1] less than 28 arms; radials and sides of the ossicles of the division series covered with very prominent irregular tubercles or short spines which extend dorsalward at the articulations where they may form narrow bands across the ends of the segments; ossicles of the division series with a prominent irregular median keel or median row of tubercles which becomes less marked on the IIBr series and is absent beyond the arm bases; division series and arms with a prominent purple median

line (eastern part of the Bay of Bengal to the Lesser Sunda Islands, and northward to the Macclesfield Bank) *vicaria* [1])

b[2] 40 arms; radials and sides of the ossicles of the division series with a fine regular granular ornamentation which never encroaches on the dorsal surface; median line of the ossicles of the division series and brachials occupied by a low and narrow, but very regular and very distinct, carination; division series and arm bases without a median purple line (southern Japan to Formosa) . . . . . *subcarinata*

a[2] Outer cirrus segments as long as, or longer than, broad; dorsal spines minute or absent

b[1] cirri with not more than 30 segments; sides of the ossicles of the division series with prominent tubercles or numerous short blunt spines

c[1] cirri about one fourth of the arm length; sides of the ossicles of the division series coarsely tubercular; a faint median line of pinkish in the proximal half of the arms; 26 arms (Molo Strait) . . *tuberculata*

c[2] cirri approximately half the arm length; sides of the ossicles of the division series with irregular and closely crowded short blunt spines; dorsal pole of centrodorsal covered with small tubercles; a median line of dark purple on the division series and arms; 15 arms (Timor) . . . . . *tenuipes*

b[2] cirri with 40 segments, and nearly half as long as the arms; ornamentation of the division series reduced to a slight and very inconspicuous roughening of the sides of the ossicles, the dorsal surface being entirely smooth; beyond the second brachial the arms bear a narrow interrupted dark purple dorsal stripe which extends nearly their entire length; about 30 arms (southwestern Japan) . . . . . *delicatissima*

1. *Mariametra vicaria* (Bell).

BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Antedon ? variispina* [sic]); p. 400 (*Antedon vicaria*).

A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 141, fig. 16 (*Mariametra margaritifera*), p. 142.

—— Smithsonian Miscellaneous Collections vol. 61, 1913, N° 15, p. 30.

Stat. 49[a]: 8° 23'.5 S., 119° 4'.6 E. (Sapeh Strait). 69 Metres. 1 Ex.

One much broken specimen with 28 arms appears to belong to this species.

2. *Mariametra tuberculata* A. H. Clark.

A. H. CLARK. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 33.

Stat. 51. Molo Strait. 69—91 Metres. 1 Ex.

1) Synonym *margaritifera* A. H. Clark.

The centrodorsal is large, thick discoidal, the dorsal pole slightly convex, 2 mm. in diameter; the cirrus sockets are arranged in two closely crowded and irregular alternating rows.

The cirri are XXI, 25—27, 20 mm. long, long and rather slender, with a slight distal taper; the first segment is short, the second longer, the third nearly as long as broad, the fourth slightly longer than broad, the sixth and following twice as long as broad; after the tenth the segments slowly decrease in length so that the last four or five before the penultimate are about as long as broad to one third again as long as broad; the last eleven or twelve bear a slight distal dorsal carination which is low and rises very gradually from the dorsal surface of the segment, but ends rather abruptly distally; it is so slight that the cirri appear practically smooth; the opposing spine is moderate in size, triangular, arising from the entire dorsal surface of the penultimate segment, terminal, and directed obliquely forward; the distal ends of the cirrus segments are slightly prominent.

The radials are almost entirely concealed by the centrodorsal, being only slightly visible in the interradial angles; IBr_1 very short, almost oblong, five or six times as broad as long; axillaries very short, nearly or quite three times as broad as long; IIBr and IIIBr 2, the latter external; sides of the elements of the division series in close apposition and sharply flattened. The proximal edge of the IBr_1 is everted and slightly scalloped; the outer edges of the axillaries are slightly thickened and everted, but smooth; the lateral third of the exposed surface of both ossicles taken together bears from a dozen to a dozen and a half prominent well rounded and entirely separate tubercles, some of which may be more or less elongate in one diameter; between the tubercular lateral and smooth dorsal surface of the elements of the IBr series there is a more or less marked prominent beaded ridge or row of tubercles which, however, may be absent; the sides of the ossicles of the IIBr series are modified in the same way as those of the ossicles of the IBr series, but not so extensively.

The arms are about 26 in number, 75 mm. long; the proximal outer angle of the first brachial is roughened for some distance inward, and sometimes is more or less tuberculated; there is a similar modification of the surface of the second brachial, but it is much less extensive; the synarthrial tubercles are small, but rather prominent; the distal edge of the brachials is only very slightly produced.

P_1 is 7 mm. long with 21 segments, tapering rather rapidly in the proximal fourth, slender from that point onward; most of the segments are about twice as long as broad. P_2 is 8 mm. long with 17—20 segments of which the first is nearly twice as broad as long, the second nearly as long as broad, the third one third again as long as broad, and the remainder about twice as long as broad; the second-fifth are narrowly carinate; the pinnule is basally little, if at all, larger than P_1, but it tapers less rapidly, and is slightly less slender distally. P_3 is 12 mm. long with 16—18 segments, slightly stiffened like P_2 in *Lamprometra protectus*; it tapers evenly from the base to the tip, and is larger and stouter than P_2, the latter more nearly resembling P_1; the proportions of the individual segments is as in P_2; the second-fourth have a slight narrow carination. P_4 is similar to P_3; it is 9 mm. long with about 16 segments, larger, longer and stouter than P_3, and stiffened like P_3. P_5 is from 4.5 mm. to 5 mm. long with 15 segments, small and weak, evenly tapering and becoming very slender distally; the

following pinnules gradually decrease in size, then increasing in length and becoming very slender distally.

The colour is white, with a faint median line of light pinkish in the proximal half of the arms.

3. *Mariametra tenuipes* A. H. Clark.

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 32.

Stat. 294. 10° 12′.2 S., 124° 27′.3 E. 73 Metres. 1 Ex.

The dorsal pole of the centrodorsal is slightly convex, 1 mm. in diameter, covered with small tubercles.

The cirri are XXVI, 24—29, 22 mm. long; the first segment is short, the second about twice as broad as the median length, the third slightly longer than broad to half again as long as broad; the sixth-eighth are about three times as long as the median diameter; the following gradually decrease in length so that the last ten or eleven are about as long as their distal diameter, or only very slightly longer; the cirri are exceedingly slender; the long proximal segments have slightly prominent ends; slight subterminal dorsal spines appear on about the eleventh segment.

The division series and arms in general resemble those of the other species of the genus. One IIIBr series is present, external.

The 15 arms are probably about 45 mm. long.

The lateral ornamentation of the division series, which occupies the outer third of the exposed surface of the elements of the IBr series thence narrowing distally and disappearing at the base of P_1, consists of very numerous small blunt spines, more or less coalescent, which show a tendency to become arranged in horizontal rows.

P_1 is 6 mm. long with about 16 segments, small and short. P_2 is 7.5 mm. long with 19 segments, resembling P_3 but not so stout, though slightly stouter than P_1. P_3 is 11 mm. long with 21 segments, slender, evenly tapering; the first segment is not quite so long as broad, the second is about as long as broad, and the fifth and following are about twice as long as broad, becoming more elongated terminally. P_4 is 9 mm. long with 19 segments, resembling P_3.

The colour is white with a narrow median line on the division series and arms of purple; the cirri are light purplish.

VI. Family Colobometridae A. H. Clark.

Key to the Genera of the Family Colobometridae.

a[1] P_a (the first inner pinnule) present on all the arms

b[1] more than 10 arms; size medium or large; cirrus segments subequal, short, bearing dorsally paired spines or tubercles; P_2 greatly enlarged,

much larger and stiffer than P_1 or P_3, recurved and horn-like, the component segments with produced and spinous distal ends . . . . **Cenometra**

b^2 10 arms; size small; at least the outer cirrus segments nearly or quite as long as broad, bearing dorsally a serrate transverse ridge (sometimes two, a proximal and a distal) or long spines

c^1 P_1 shorter, smaller and weaker than P_2; P_2, and usually also P_3, elongated, enlarged and stiffened, with the distal edges of the segments produced into spinous overlapping borders, or with the distal portion of the prismatic angles produced into rounded or pointed processes

d^1 30 or more cirrus segments of which only the basal bear transverse ridges these after the proximal fourth of the cirrus transforming into very long dorsal spines; P_2 has at most 12 segments . . **Cotylometra**

d^2 25 or fewer (usually about 20) cirrus segments, of which all but the terminal bear transverse ridges; P_2 has at least 15, and usually about 20, segments. . . . . **Oligometra**

c^2 P_1 the longest and stoutest pinnule on the arm

d^1 the third-fifth segments of the genital pinnules more or less expanded laterally to protect the genital glands; a single median transverse ridge on the cirrus segments

e^1 P_1, though longer and stouter than P_2, not exceptionally so; median transverse ridge on the cirrus segments of moderate height **Austrometra** [1])

e^2 P_1 much stouter than P_2, and so enlarged basally as to cause the second brachial to appear like an axillary; median ridge on the cirrus segments very high. . . . . **Analcidometra**

d^2 no expansion of the genital pinnules; the cirrus segments bear two transverse ridges, a proximal and a distal . . . . . **Oligometrides**

a^2 P_a absent

b^1 more than 10 arms

c^1 P_1 as long as, and similar to, P_2; IIBr series commonly 4 (3 + 4); outer cirrus segments with a low dorsal transverse ridge . . . . **Petasometra**

c^2 P_1 shorter than P_2; all the division series always 2; outer cirrus segments somewhat shorter than the proximal, bearing paired or tripled dorsal spines which on the terminal become resolved into a single median spine, or a median carination

d^1 P_1 much smaller, weaker and more slender than the enlarged and stiffened P_2; 10—30 arms; 21—30 cirrus segments; outer cirrus segments with paired or tripled dorsal spines, which become a single median spine terminally . . . . . **Cyllometra**

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1) Genotype *Oligometra thetidis* H. L. Clark, 1909; this genus is only known from southeastern Australia.

d^2 P_1 similar to P_2, but shorter; first three or four pinnules exceedingly long, extremely slender, stiff, composed of greatly elongated segments; about 40 arms; 37—39 cirrus segments of which the eighth is a well marked transition segment; the outer cirrus segments have a slightly produced distal edge and a median carination; the opposing spine is double, forming two thick lobes, one on either side of the median line . . . . . **Epimetra**

b^2 10 arms

c^1 the outer cirrus segments bear long and prominent dorsal spines, which may be single or paired, and are shorter than the proximal

d^1 more than 35 cirrus segments of which the outer are much shorter than the proximal, the latter being more or less elongated, and bearing paired dorsal spines; pinnules long and very stiff, the component segments with very spinous distal ends; proximal pinnules elongated, with greatly elongated segments; distal edges of the longer cirrus segments fringed with spines . . . . . **Colobometra**

d^2 less than 35 cirrus segments of which the outer are but slightly shorter than the proximal and bear single median dorsal spines; pinnules short and somewhat stiffened, the component segments with spinous distal ends; proximal pinnules short, with short segments; distal edges of the cirrus segments smooth . . . . **Cotylometra**

c^2 the outer cirrus segments bear a serrate transverse ridge dorsally, and are as long as, or slightly longer than, the proximal

d^1 P_1 resembling P_2, and of about the same length

e^1 25 or more cirrus segments, all of which are broader than long; the segments of the long and stiff P_1 and P_2 have smooth distal edges . . . . . **Petasometra**

e^2 23 or fewer cirrus segments, the third-sixth and following about as long as broad; the segments of the long stiff lower pinnules have very spinous distal ends . . . . . **Prometra**

d^2 P_1 shorter, more slender, and weaker than P_2

e^1 most, or all, of the cirrus segments broader than long; P_2 (and P_3 if enlarged) distally usually more or less flagellate; no lateral processes and few or no spines on the edges of the segments of the lower pinnules . . . . . **Decametra**

e^2 all but the basal cirrus segments about as long as broad; enlarged proximal pinnules commonly spine-like, without a flagellate tip, the distal edges of the segments bearing lateral processes or long spines

f^1 enlarged lower pinnules with elongated segments which have very spinous distal ends . . . . . **Prometra**

f^2 enlarged lower pinnules with comparatively short segments which have broad longitudinal flange-like processes on the outer part of the prismatic ridges . . . . . **Oligometra**

Petasometra A. H. Clark.

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 25.
—— Die Fauna Südwest-Australiens, vol. 4, 1913, Lief. 6, p. 311.

Key to the Species of the Genus Petasometra.

a^1 10—14 arms; 20—29 (usually 20—25) cirrus segments (Flores and Amboina . . . . . *clarae*
a^2 over 20 arms; 28—31 cirrus segments (western Australia) . . . . *helianthoides*

1. *Petasometra clarae* (Hartlaub).

Hartlaub. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 41, pl. 2, fig. 19 (*Antedon clarae*).

Stat. 50. Bay of Badjo, west coast of Flores. 40 Metres. 3 Ex.
Stat. 231. Amboina. 3 Ex.

Of the three specimens from Stat. 50 one has 11 arms 85 mm. long; one IIBr 1 series is present, the IIBr axillary being supported equally by the IBr axillary and by the outer side of the IBr_1; another has 10 arms 85 mm. long and cirri 13 mm. long composed of 20—22 segments; the dorsal pole of the centrodorsal is circular, slightly concave, 2 mm. in diameter; the cirrus sockets are arranged in a single regular crowded row; the colour is dark brown, the cirri and centrodorsal light yellow brown; the IBr series and first brachials are white; there are one or two distinct white patches on individual arms; the third has 10 arms 85 mm. long; the cirri are VII, 19—20, 12 mm. long; the dorsal pole of the centrodorsal is slightly concave, circular, 2 mm. in diameter; the cirrus sockets are arranged in a single perfectly regular crowded row.

These specimens differ from the large individual from Amboina in having slightly fewer cirrus segments, and in having P_3 proportionately smaller; but both of these differences are directly correlated with the smaller size.

One of the examples from Amboina has 10 arms 120 mm. long; the centrodorsal is discoidal, the dorsal pole large, circular, slightly concave, 2.6 mm. in diameter; the cirrus sockets are arranged in a single perfectly regular marginal row; the cirri are XIV, 26—29, 17 mm. long, rather stout; owing to the very crowded condition of the cirrus sockets, which are all in one regular row, the first segment of the cirri, as viewed dorsally, is very narrow; from this segment the cirrus increases in diameter to the fourth, which is at least three times as wide as the first, and then tapers almost imperceptibly to the tip; all of the cirrus segments are approximately equal in length, short, about twice as broad as long; the lateral margins of the segments in the proximal half of the cirri are strongly bent, but those in the distal half are straight; beginning on the second or third there is a straight serrate transverse ridge, at

first terminal, but becoming median on about the fifth or sixth; on the antepenultimate segment this becomes a single small median spine; the opposing spine is long, median, erect, very much longer than the minute spine on the preceding segment, equal to about half the lateral diameter of the penultimate segment in height; the terminal claw is about half again as long as the preceding segment, stout in the basal third but becoming slender in the distal two-thirds, strongly curved basally but becoming nearly straight distally; the dorsal surface of the cirri is broad and flat, rather abruptly separated from the lateral surface.

The radials are almost entirely concealed by the centrodorsal; the IBr_1 is very short, three and one half times as broad as long, widely separated from its neighbours laterally; the IBr_2 is broadly pentagonal, twice as broad as long; the synarthrial tubercles are moderately developed. The dorsal surface of the arms is almost smooth.

P_a is absent; P_1 is 9 mm. long with 24 segments of which the first is twice as broad as long and the following gradually increase in length becoming about as long as broad on the fourth and thereafter slightly longer than broad. P_2 is similar, but slightly longer and slightly stouter. P_3 is similar, but somewhat smaller and shorter than P_1, 7 mm. long with 16 segments; P_4 is 4.5 mm. long with 15 segments of which the distal are elongate; the following pinnules are similar; the distal pinnules are very slender, 12 mm. long.

The colour is yellow brown with purplish blotches on the arms; the outer half of the cirri is purplish.

Another specimen has 14 arms 120 mm. long; all four of the IIBr series are 4 (3 + 4); the cirri are XVI, 23—24 (usually 23), 15 mm. long; the dorsal pole of the centrodorsal is slightly concave, 3 mm. in diameter. P_1 is 8 mm. long. P_2 is 9.5 mm. long with 22 segments. P_3 is 6.5 mm. long. P_4 and the following pinnules are 4.5 mm. long, very delicate; the large proximal pinnules are somewhat stiffened. The distal pinnules are 9 mm. long. The colour is the same as in the preceding.

The third specimen is small; it has 10 arms 55 mm. long.

Cyllometra A. H. Clark.

Key to the Species of the Genus Cyllometra.

a[1] The proximal cirrus segments are longer than broad, and may be twice as long as broad or even longer

  b[1] cirri of moderate length and stoutness, the distal segments broader than long; the cirrus segments beyond the basal bear long and prominent dorsal spines which at first are simply forked, then usually tridentate, later transforming into a high dorsal process with a straight edge parallel to the distal border of the segment, which gradually becomes a simple high dorsal spine; 11—20 arms (Philippine Islands). . *disciformis*

  b[2] cirri long and slender with the distal segments longer than broad and bearing minute dorsal tubercles; usually 25—30 arms (Lesser Sunda Islands) . . . . . *gracilis*

a^2 The longest proximal cirrus segments are not longer than the diameter of their distal ends

b^1 cirrus segments subequal, mostly about as long as broad, the outer with minute dorsal tubercles; 10—30 (usually 20) arms (southern Japan and the Liu Kiu Islands) . . . . . *albopurpurea*

b^2 outer cirrus segments broader than long and bearing small, but prominent, dorsal spines

c^1 19—29 arms; IIIBr series present; outer edges of the segments of P_2 with prominent spines at the prismatic angles (Ki and Lesser Sunda Islands) . . . . . *manca*

c^2 14—18 arms; no IIIBr series; outer edges of the segments of P_2 with small spines at the prismatic angles (Persian Gulf) . . *soluta*

1. *Cyllometra gracilis* A. H. Clark.

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 35.

Stat. 49a. 8° 23′.5 S., 119° 4′.6 E. Sapeh Strait. 69 Metres. 14 Ex.

The centrodorsal is discoidal with a flat or slightly concave dorsal pole 2.0 mm. in diameter; the cirrus sockets are arranged in one and a partial second marginal row.

The cirri are XXIII, 25—30, 21 mm. long; the first segment is short, the second about twice as long (one third to one half again as broad as long), the third slightly longer than broad, the fourth slightly longer than the third, the fifth nearly as long as the sixth; the sixth-ninth or -tenth are about twice as long as the proximal diameter; the following gradually decrease in length so that the last twelve before the penultimate are subequal, slightly longer than broad. The cirri as a whole are long and unusually slender; owing to the crowded condition of the cirri on the centrodorsal the first segment of each cirrus is sharply flattened laterally against those of the cirri on either side; the distal dorsal edge of the fourth and following segments is slightly swollen, this after the seventh becoming a trio of dorsal spines, a central larger and two smaller lateral; the central projects more dorsally than the other two, but does not extend so far distally; all three are very small; on the last twelve to fifteen segments before the penultimate the lateral spines disappear and the median becomes slightly more prominent, occurring as a single submedian tubercle, directed obliquely forward; all the dorsal processes are small and inconspicuous.

The radials project very slightly beyond the centrodorsal in the median line, but extend well up in the angles of the calyx entirely and widely separating the bases of the IBr_1; the division series resemble those of the other species of the genus.

In the larger specimens the arms are from 26 to 28 in number, and about 50 mm. long; the arrangement of the arms on the rays is 2, 1, 1, 2; IIIBr series appear always to be present, at least on a minority of the rays, and are always external.

The long distal cirrus segments which bear dorsal processes so slight as scarcely to be noticeable indicate that this species is most closely related to the Japanese *C. albopurpurea*.

2. *Cyllometra manca* (P. H. Carpenter).

P. H. CARPENTER. Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, p. 5 (*Antedon* sp.).
—— "Challenger" Reports. The Comatulae, 1888, p. 226, pl. 44, figs. 2, 3 (*Antedon manca*).

Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 1 Ex.

The dorsal pole of the centrodorsal is flat, 2 mm. in diameter. The cirri are XV, 31, about 15 mm. long; the fifth-seventh segments are about as long as their distal diameter; the sixth and following have prominent paired dorsal spines which at first are widely separated but distally approach each other and merge into a single spine on the last two segments before the penultimate. The 19 arms are 60 mm. long, and are arranged on the five rays as follows: 3 (1 + 3); 4 (1 + 3); 3 (1 + 2); 6 (2, 1, 1, 2); 2; the IIIBr series are all external. P_2 is 11 mm. long, and is composed of 16 segments.

3. *Cyllometra disciformis* (P. H. Carpenter).

As yet we are unable to state with certainty what really constitute the valid specific characters in the genus *Cyllometra*. The number of arms is subject to so much individual variation as to be of uncertain value, while the same is true of the length, number of component segments and character of the enlarged proximal pinnules. At present we are inclined to regard the cirri as offering the best criteria for specific differentiation, though they also are very variable. But *C. albopurpurea* and *C. gracilis* may be readily distinguished from all of the other types by a glance at their cirri, and that is something gained.

The cirri of typical *C. disciformis* and typical *C. manca* are very different. In both the dorsal spines are well developed (as compared with *C. albopurpurea* and *C. gracilis*), but in *C. disciformis* they are much longer than in *C. manca*, while furthermore the earlier cirrus segments are elongated, twice as long as broad instead of only very slightly, if at all, longer than broad. However, in deep and cold water as a rule the elongated earlier cirrus segments of *C. disciformis* rapidly shorten, so that the character of the cirri approaches that of typical *C. manca*.

I have before me 56 specimens which I have referred to *C. disciformis*, all from the Philippine Islands:

East of Masbate, 80 fathoms ("Albatross" Stat. 5213; Cat. N° 35314 U. S. Nat. Mus.); 45 Ex. Of these the largest have arms 95 mm. long; ten have 11 arms, eight have 12 arms, six have 13 arms, four have 14 arms, three have 15 arms, two have 16 arms, three have 17 arms, two have 19 arms, and four have 20 arms; one is badly broken, and there are two ten-armed young.

East of Masbate, 80 fathoms ("Albatross" Stat. 5213; Cat. N° 36037 U. S. Nat. Mus.); 1 Ex.

East of Masbate, 108 fathoms ("Albatross" Stat. 5212; Cat. N° 35348 U. S. Nat. Mus.); 3 Ex. These have 16, 18 and 20 arms.

North Balabac Strait, 58 fathoms ("Albatross" Stat. 5356; Cat. N° 35280 U. S. Nat. Mus.); 1 Ex.

North Balabac Strait, 58 fathoms ("Albatross" Stat. 5356; Cat. N° 35275 U. S. Nat. Mus.); 2 Ex. These have 15 and 21 arms.

Verde Island Passage, 180 fathoms ("Albatross" Stat. 5367; Cat. N° 36224 U. S. Nat. Mus.); 1 Ex.

Near Marinduque, 106 fathoms ("Albatross" Stat. 5369; Cat. N° 35949 U. S. Nat. Mus.); 1 Ex. A typical example with 12 arms.

Tawi Tawi group, 12 fathoms ("Albatross" Stat. 5154; Cat. N° 35270 U. S. Nat. Mus.); 1 Ex. There are 19 arms.

Zebu reefs, littoral (from the "Challenger" collection; Cat. N° 17529 U.S. Nat. Mus.); 1 Ex.

Decametra A. H. Clark.

Key to the Species of the Genus Decametra.

a^1 The distal edges of the segments of the much enlarged and stiffened P_2, which is from half again to twice as long as the approximately equal P_1 and P_3 and is composed of 14—20 segments, bear groups of prominent spines at the prismatic angles; lower pinnules all stiffened; 16—20 cirrus segments; arms 50 mm. long (southern Japan) . . . . . *tigrina*

a^2 The distal edges of the segments of P_2 do not bear groups of prominent spines at the prismatic angles; except for P_2 and sometimes P_3 (more rarely P_1) the lower pinnules are not stiffened

b^1 P_3 resembling P_2 and longer than P_1; P_2 with 15—17 segments

c^1 20—23 cirrus segments; arms 65 mm. to 75 mm. long

d^1 cirri stouter, the majority of the segments being twice as broad as long or even somewhat broader (Philippine Islands) . . . . *mylitta*

d^2 cirri more slender, the majority of the segments being only slightly broader than long (Kurrachi, India) . . . . . *mollis*

c^2 25—29 cirrus segments; arms 80 mm. to 110 mm. long

d^1 P_2 is stout, less than half again as long as P_1, and none of its component segments are longer than broad (southwestern Indian Ocean) . . . . . *alaudae*

d^2 P_2 is rather slender, nearly or quite twice as long as P_1, and most of its component segments are from half again to twice as long as broad

e^1 most of the segments of P_2 are from one third to one half again as long as broad, with prominent, though not spinous, distal ends (Ceylon) . . . . . *taprobanes*

e^2 most of the segments of P_2 are twice as long as broad, with spinous distal angles (Muscat, Arabia) . . . . . *arabica*

b^2 P_3 shorter than P_1

c^1 P_2 has 17—18 smooth segments which do not bear spines on their distal angles; arms 45 mm. to 50 mm. long

d¹ 18—23 cirrus segments; P_1 with 14—15 segments, nearly as long as P_2 and of the same character; the segments of P_2 beyond the fifth are only slightly longer than broad; arms 50 mm. in length (Saleyer). *laevipinna*

d² 16—18 cirrus segments; P_1 slender, becoming flagellate distally, less stout and stiff than P_2, with 16 segments; the segments of P_2 from the fourth onward are about half again as long as broad; arms 45 mm. long (western Australia). . . . . *studeri*

c² P_2 has 10—14 segments which bear fine spines on the distal angles

d¹ 21—23 cirrus segments, most of which are about twice as broad as long, the antepenultimate being nearly or quite as long as broad; P_2 has 12—13 segments; arms about 35 mm. long (Ceylon and vicinity) . . . . . *brevicirra*

d² not more than 20 cirrus segments

e¹ 15—20 cirrus segments; P_2 has about 13 segments; arms 35 mm. to 50 mm long

f¹ all of the cirrus segments broader than long; outer segments of P_2 less than twice as long as broad; 15—18 cirrus segments; arms 40 mm. long (Philippine Islands). . . . . *informis*

f² outer cirrus segments about as long as broad; segments in the distal half of P_2 twice as long as broad; 14—20 cirrus segments; arms 35 mm. to 50 mm. long (southeastern Africa and Mauritius) . . . . . *modica* [1])

e² 10—15 cirrus segments, those beyond the fifth-seventh about as long as broad; P_2 has 8—11 segments; arms 35 mm. to 40 mm. long

f¹ 14—15 cirrus segments; P_2 has 11 segments (Paternoster Islands) . . . . . *parva*

f² 10—12 cirrus segments; P_2 has 8—9 segments (Celebes). . *minima*

1. *Decametra mylitta* A. H. Clark.

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 36.

Stat. 99. 6° 7′.5 N., 120° 26′ E. Anchorage of North-Ubian Island. 16—23 Metres. 4 Ex.

The centrodorsal is discoidal, the flat dorsal pole 1.5 mm. in diameter; the cirrus sockets are arranged in two closely crowded alternating rows.

The cirri are XIX, 21—23, 10 mm. to 11 mm. long; the cirrus segments are subequal in length, the first very short, the second slightly longer, the third and following about twice as broad as long or slightly broader, the last three before the penultimate increasing slightly in length so that the antepenultimate is about one third again as broad as long; the earlier segments have the dorsal surface swollen and truncated distally so that the dorsal profile is

1) Synonym *Decametra möbiusi* A. H. Clark.

serrate; after the first three the dorsal profile of the individual segments becomes straighter, making a considerable angle with the longitudinal axis of the cirrus, and the distal edge becomes straight, forming a very finely spinous transverse ridge which, however, is not raised above the general dorsal surface of the segments; this transverse ridge becomes gradually more and more marked, at the same time moving more and more toward the centre of the dorsal surface; at the ninth segment it becomes median and begins to become slightly concave in profile, and after the fourteenth it resolves itself into two prominent entirely distinct tubercles situated side by side, the distance between the apices of these tubercles being about equal to the distance from either apex to the lateral border of the segment; distally these tubercles gradually move toward each other, at the same time moving nearer and nearer the proximal margin of the segments; on the fourth before the penultimate the tubercles merge into a single transversely elongate tubercle which becomes less and less elongate and on the antepenultimate becomes a single small tubercle situated near the proximal margin of the segment. As a whole the cirri are moderately stout; in lateral view, though the dorsal profile is serrate, no distinct dorsal processes are seen except in the distal half when the tubercles appear as minute dorsal processes.

The arms are 10 in number, 75 mm. long, and resemble those of the other large species of the genus.

P_1 is 5 mm. long, small and weak, with 14 segments, tapering with moderate rapidity in the proximal half and becoming very slender in the distal half; the first segment is short, the following gradually increasing in length and becoming about as long as broad on the fourth and fifth and distally about twice as long as broad; the pinnule is slightly prismatic. P_2 is 9 mm. long with 17 segments, not greatly larger than P_1 basally but tapering evenly from the base to the tip; the first two segments are slightly broader than those following, much broader than long, the third slightly broader than long, the fourth slightly longer than broad, and the following about half again as long as broad, becoming twice as long as broad toward the end of the pinnule; the pinnule is rounded prismatic; the fourth and following segments have slightly produced and spinous distal edges, this feature gradually increasing in extent distally and being most marked at the prismatic angles. P_3 is 6 mm. long with 14 segments, similar to P_2 but very slightly smaller; P_4 is 5 mm. long with 13 segments, similar to P_3 but slightly smaller. P_5 is 4.5 mm. long with 14 segments, resembling P_4 but with proportionately shorter segments. P_6 is 4 mm. long with 15 segments, resembling P_5 but with proportionately shorter segments; the following pinnules are similar to P_6. The distal pinnules are very slender, 7 mm. long with 21 segments of which the longest are about twice as long as broad.

The colour is light yellowish, banded with purple at the brachial articulations.

Another specimen has the arms 75 mm. long and the cirri XIV, 23—25, 11 mm. long; as in the preceding the first cirrus segment is strongly compressed laterally through crowding by its fellows; P_1 is 6 mm. long with 15 segments; P_2 is 9 mm. long with 17 segments; P_3 is 6.5 mm. long with 14 segments; P_4 is 5 mm. long with 12 segments; P_5 is 4.5 mm. long with 13 segments.

The remaining two specimens are similar.

This species is most closely related to *D. mollis* from Kurrachi from which it differs in having the cirri slightly stouter with most of the segments twice as broad as long or even somewhat broader instead of only slightly broader than long as in *D. mollis*; in having the proximal pinnules, while of about the same proportions as those of *D. mollis*, relatively longer and stouter and composed of somewhat shorter segments; and in having the synarthrial tubercles less marked.

A specimen before me which I refer to *D. mylitta*, dredged near Joló, Philippine Islands, in 20 fathoms ("Albatross" Stat. 5139; Cat. N° 35338, U. S. Nat. Mus.), with an arm length of 57 mm., agrees with one of those above described in having the cirrus segments somewhat longer than usual, and more like those of *D. mollis*.

It is possible that *D. mylitta* is only a variety of *D. mollis*, and it may be that in reality they are identical.

2. *Decametra laevipinna* (A. H. Clark).

A. H. CLARK. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 37 (*Prometra laevipinna*).

Stat. 213. Saleyer. Reef. 1 Ex.

The centrodorsal is discoidal with a broad flat circular dorsal pole 2 mm. in diameter; the cirrus sockets are arranged in a single closely crowded marginal row.

The cirri are XIV, 18—23, 13 mm. long; the first segment is very short and the following gradually increase in length, after the tenth or eleventh being about as long as broad; the first segment has the distal dorsal edge produced; on the second and third this becomes a strong transverse ridge which gradually moves anteriorly, becoming median on the eighth and following, and appearing as a minute median spine in lateral view; this ridge shows no tendency to resolve itself into paired spines or tubercles, nor does it narrow appreciably on the outer segments, occurring as a broad transverse ridge even on the antepenultimate; the opposing spine is small, slender, median, erect, about equal to one fourth of the lateral diameter of the penultimate segment in height.

The arms resemble those of the other species of the genus, and are about 50 mm. long. P_1 is 5.5 mm. long, moderately slender, somewhat stiffened, with 14—15 segments of which the first is short, the following gradually increasing in length and becoming about as long as broad on the fifth, and on the outer very slightly longer than broad; from the third segment outward the pinnule is rather strongly prismatic with a prominent rounded ridge running along the centre of the outer surface. P_2 is 6.5 mm. long with 17 segments, resembling P_1 but slightly more slender basally and tapering more evenly to the tip, and not so strongly prismatic; the outer edges of the segments of both these pinnules are perfectly smooth. P_3 is 4.5 mm. long with 14 segments, similar to P_2 but proportionately smaller and more slender distally. P_4 is 3.5 mm. long with 13 segments, small and slender. P_5 is similar, 3.0 mm. long with 11 segments. P_6 is similar to P_5, 3.0 mm. long with 12 segments. The distal pinnules are very slender, 7.0 mm. long with 20—22 segments.

3. *Decametra parva* (A. H. Clark).

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 39 (*Prometra parva*).

Stat. 260. 5° 36'.5 S., 132° 55'.2 E. 90 Metres. 1 Ex.
Stat. 315. Anchorage east of Sailus Besar, Paternoster Islands. Up to 36 fathoms. 2 Ex.

The cirri are XIV, 14—15, 5.5 mm. long, and resemble those of *D. minima*; the sixth or seventh and following segments are about as long as broad.

The ten arms are 40 mm. long; the lower discoidal brachials are smooth, but those following have rather strongly everted distal ends.

P_1 is 2.3 mm. long with 11 segments; it tapers rather rapidly in the first four segments, more gradually from that point onward; the first segment is short, the second slightly longer, the third slightly broader than long, the fourth slightly longer than broad, the fifth and following about twice as long as broad; P_2 is from 3.5 mm. to 4.5 mm. long with 11 segments, evenly tapering, much larger and stouter than the other pinnules, though not greatly enlarged; the first segment is short, the second half again as broad as long, the third slightly broader than long, the following gradually increasing to the seventh which, with the following, is twice as long as broad; the pinnule is rather strongly prismatic, and the fourth and following segments have their distal edges produced at the prismatic angles into prominent short stout spines which increase in prominence distally. P_3 is 1.5 mm. long, small and weak, with eight segments of which the distal are elongated. P_4 is slightly smaller than P_3. The distal pinnules are exceedingly slender, 4.0 mm. to 4.5 mm. long with 13 segments of which the second and third are slightly carinate and the outer are greatly elongated.

The second specimen from Stat. 315 has the arms 35 mm. long and the cirri VII, 14—15, 5.5 long; P_2 is not quite so much enlarged as in the one described.

In addition to the three noticed above I have before me two specimens of this species from near Joló, Philippine Islands, in 13 fathoms ("Albatross" Stat. 5557; Cat. N° 36022 U. S. Nat. Mus.).

4. *Decametra minima* (A. H. Clark).

A. H. Clark. Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 38 (*Prometra minima*).

Stat. 79a. 2° 38'.5 S., 117° 46' E. (Borneo Bank). 54 Metres. 1 Ex.
Stat. 117. 1° 0'.5 N., 122° 56' E. (Kwandang Bay entrance). 80 Metres. 24 Ex.
Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 1 Ex.
Stat. 260. 5° 36'.5 S., 132° 55'.2 E. Near Kei Islands. 90 Metres. 1 Ex.

The centrodorsal is thin discoidal, the dorsal pole flat, finely papillose, 1 mm. in diameter.

The cirri are X (rarely any other number), 10—12, 3 mm. to 4 mm. long; the first segment is short, the following increasing in length to the fifth or sixth which, with the following, is about as long as broad; the second and following bear a finely serrate transverse ridge which becomes median in position after the fourth or fifth; it is low and very narrow, appearing as

a very minute sharp spine in lateral view; on the second-fourth segments the lateral angles of this ridge project beyond the borders of the cirrus segments as seen dorsally, but from that point onward it becomes narrower, beyond the sixth dividing more or less completely into two transversely oblong sharp ridges or small sharp spines; the antepenultimate segment bears a single spine; the opposing spine is much larger than the spine on the preceding segment.

The radials are just visible beyond the centrodorsal; the IBr_1 are very short, about four times as broad as long, with the proximal and distal edges straight and parallel, and the lateral edges converging slightly; there are slight rounded ventrolateral projections; the axillaries are broadly pentagonal, half again as broad as long; synarthrial tubercles are moderately developed; like the IBr_1 the axillaries and first brachials have slight rounded ventrolateral processes. The arms resemble those of the other species of the genus; on the lower oblong brachials there is a faintly indicated rounded median carination. The arms are 35 mm. to 40 mm. long, and very slender.

In some specimens the ventrolateral processes on the ossicles of the IBr series and the first brachials are produced into a rounded triangular flange, of which the axillary has two, a proximal and a distal.

P_1 is 2 mm. long with 8 or 9 segments, nearly as stout basally as P_2, but tapering more rapidly and becoming slender and delicate distally; the first segment is short, the following gradually increasing in length and becoming slightly longer than broad on the third and about twice as long as broad distally; the distal edges of the outer segments are slightly spinous. P_2 is 3 mm. long, stiff and spine-like, though slender, tapering slowly from the base to the tip, composed of 8 or 9 segments of which the first is twice as broad as long, the second is nearly as long as broad, and the third is nearly twice as long as broad; the remainder are about three times as long as broad; the third and following bear long and prominent spines on the prismatic angles; the pinnule is rather strongly prismatic. P_3 is 2 mm. long, small and slender, slightly stiffened, composed of 8 segments which become elongate distally. P_4 is 125 mm. long, very delicate and not stiffened, composed of 9 segments which become much elongate distally. P_5 is similar to P_4, but slightly shorter. The distal pinnules are 2.5 mm. long, exceedingly slender and delicate, composed of 13 segments of which the second and third are strongly carinate and the outer are very greatly elongated.

Some specimens show a much greater development than others of the spines on the segments of the lower pinnules.

The disk is thickly sprinkled, or almost covered, with small rounded plates.

The specimen from Stat. 79[a] has the arms about 15 mm. long, and 11—12 cirrus segments; that from Stat. 144 has arms about 20 mm. long; that from Stat. 260 has arms 28 mm. long, and cirri with 11 segments.

In addition to those mentioned above I have before me a specimen from the Gulf of Dávao, Philippine Islands, dredged in 18 fathoms ("Albatross" Stat. 5248; Cat. N° 36038 U. S. Nat. Mus.).

5. *Decametra informis* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. The Comatulae, 1888, p. 205, pl. 33, fig. 3 (*Antedon informis*).

I have at hand a specimen of this species from the Gulf of Dávao, Philippine Islands, dredged in 23 fathoms ("Albatross" Stat. 5249; Cat. N° 35282 U. S. Nat. Mus.).

Colobometra A. H. Clark.

Key to the Species of the Genus Colobometra.

a¹ Cirri very long with about 60 (53—65) segments of which the longest are one third again as long as broad; P_3 slightly larger than P_2; following pinnules to P_6 or P_8 similar, slightly decreasing in length (Moluccas and New Guinea to New South Wales and Lord Howe Island) . . . . *perspinosa* [1])

a² Cirri shorter, with not more than 52 segments; P_3 not longer than P_2

b¹ 44—52 cirrus segments, none of which are as long as broad; P_3 similar to P_2 and of the same length; P_4 similar, but shorter; P_1 not greatly stiffened, composed of segments which become twice as long as broad on the sixth and following (Moluccas to Singapore) . . . . . *vepretum*

b² not more than 40 (29—40) cirrus segments, of which the longest are longer than broad

c¹ P_2 markedly longer and stouter than the succeeding pinnules; P_3 similar to P_2 but shorter and more slender; 29—40 (usually about 35) cirrus segments of which the two or three before the penultimate bear single median dorsal spines (Ceylon and the Bay of Bengal to the Lesser Sunda Islands, Borneo and the Philippines) . . . . . *discolor*

c² P_2 to P_5 or P_7 approximately equal in length and stoutness

d¹ P_1 resembles P_2 and is stiff and spine-like with 10 segments of which the fourth and following are about four times as long as broad; only the antepenultimate cirrus segment bears a single median dorsal spine; P_2 to P_5 similar and of approximately equal length (Solomon Islands) . . . . . *diadema*

d² P_1 is much less stiff than P_2, and is composed of 21 segments none of which are more than very slightly longer than broad; the 18—22 segments before the penultimate bear single median dorsal spines; P_2 to P_7 approximately equal in length and similar, with a very slight development of spines on the distal borders of the component segments (Philippine Islands) *suavis*

1) Synonyms *Antedon insignis* Bell, and *Antedon lóveni* Bell, 1884 (not *Antedon lovéni* Bell, 1882 = *Antedon pumila* Bell, 1884).

1. *Colobometra perspinosa* (P. H. Carpenter).

P. H. Carpenter. Notes from the Leyden Museum, vol. 3, 1881, p. 178 (*Antedon perspinosa*).
Bell. Proc. Zoöl. Soc. London, 1882, p. 534 (*Antedon insignis*).
—— "Alert" Report, 1884, p. 158 (*Antedon lovéni*).
Hartlaub. Nova Acta der Ksl. Leop.-Carol. Akad. der deutschen Naturforsch., vol. 58. 1891, N° 1, p. 85 (reference to the Leyden specimen and to *Antedon lovéni* only).
A. H. Clark. Notes from the Leyden Museum, vol. 33, 1911, p. 188.
—— Recent Crinoids of Australia, 1911, p. 773.
—— Crinoids of the Indian Ocean, 1912, p. 164.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 37.

Stat. 40. Anchorage off Pulu Kawassang, Paternoster Islands. 12 Metres. 1 Ex.
Stat. 149. West coast of Gebé Island; Fau anchorage and lagoon. 31 Metres. 1 fragment.
Stat. 240. Banda. 9—36 Metres. 1 Ex.

On the specimen from Stat. 40 only a single undeveloped cirrus with 49 segments remains.

The individual from Banda has arms 130 mm. long, and cirri X (with some rudimentary), 56—63, 45 mm. to 50 mm. long. The colour is black, tinged with violet.

2. *Colobometra discolor* A. H. Clark.

A. H. Clark. Proc. U. S. Nat. Mus., vol. 36, 1909, p. 640.
—— Proc. U. S. Nat. Mus., vol. 39, 1911, p. 543.
—— Crinoids of the Indian Ocean, 1912, p. 166, fig. 25, p. 167.

Stat. 80. 2° 25′ S., 117° 43′ E. Borneo Bank. 40—50 Metres. 4 Ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. 73 Metres. 1 Ex.

The largest specimen from Stat. 80 has the cirri XV, 36—39, 18 mm. to 21 mm. long; the cirri are slightly more slender than in the type series, with the long proximal segments slightly more elongate; the dorsal pole of the centrodorsal is papillose; P_1 is 5.5 mm. long with 13 segments; P_2 is 9.5 mm. long with 14 segments; P_3 is 8.5 mm. long with 14 segments, similar to P_2; P_4 is 6.5 mm. long with 11 segments, similar to P_3; P_6 is 7 mm. long. The elongated proximal pinnules are relatively shorter and more recumbent than in the typical form.

Of the other specimens two have arms 40 mm. and 45 mm. long respectively; the third has arms 15 mm. long and cirri IX, 12, 3 mm. long, resembling the cirri of the species of *Prometra*, the segments being mostly about as long as broad. On most of the arms P_3 and P_4 have not as yet appeared.

The example from Stat. 310 has the cirri with 39—48 segments (one of each), 25 mm. to 35 mm. long; the longest cirrus segments are slightly longer than broad; P_1 is 8 mm. long with 19 segments; P_2 is 12.5 mm. long with 18 segments; P_3 is 10.5 mm. long with 14—17 segments; P_4 is 9 mm. long with 15 segments; the lower pinnules are rather less stiffened than usual in this species, and are slightly recurved; the spines on the distal ends of the pinnule segments are shorter and less prominent than is commonly the case; there are no synarthrial tubercles. The size is the same as that of specimens of this species at hand from the Andaman Islands.

Prometra A. H. Clark.

Key to the Species of the Genus Prometra.

a^1 The first three pinnules are of the same length and character, but P_4 and the following pinnules are much shorter

b^1 16—21 (usually 18—19), cirrus segments; P_1—P_3 with 14—16 segments; arm length 55 mm. to 60 mm. (southern Japan) . . . . . *owstoni*

b^2 14—15 cirrus segments; P_1—P_3 with 11—12 segments; arm length about 30 mm. (Philippine Islands) . . . . . *longipinna*

a^2 The first three pinnules are not of the same length

b^1 P_2 greatly elongated, becoming very slender and almost flagellate distally, nearly twice as long as P_1 and P_3, which are of the same length, composed of 21 segments; arm length 90 mm.; cirri with 22—24 segments (Red Sea). . . . . *chadwicki*

b^2 P_1 is longer than P_2, which otherwise exactly resembles it; both are composed of 8 segments; arm length 18 mm.; cirri with 10—11 segments (Andaman Islands). . . . . *intermedia* [1])

1. *Prometra longipinna* sp. nov.

This species closely resembles *P. owstoni*; it may be briefly diagnosed as follows:

The cirri have 14—15 segments of which the fourth and following are about as long as broad; the cirrus length is about 4 mm.

The arms are about 30 mm. long, resembling those of *P. owstoni*.

P_1 is 5 mm. long, stiff and spine-like, composed of 11—12 segments of which the first is broader than long, the second one third again as long as broad, and the fourth and following two and one half to three times as long as broad; the terminal three or four have prominently spinous distal ends. P_2 is 5 mm. long with 11—12 segments, exactly resembling P_1. P_3 is 5 mm. long with 11 segments of which the outer are slightly more elongate than those of the preceding pinnules, and the fourth and following have everted and spinous distal ends. P_4 and the following pinnules are 3.5 mm. long with 10 segments, smaller and weaker than the preceding pinnules, though the component segments are of about the same proportions; the fourth and following have everted and spinous distal ends. The distal pinnules are 4.5 mm. long with 14 segments of which the third and following have slightly produced and finely spinous distal ends.

The single specimen at hand was dredged in North Balabac Strait, Philippine Islands, in 58 fathoms ("Albatross" Stat. 5356; Cat. N° 35366 U. S. Nat. Mus.).

No species of this genus was secured by the "Siboga", but it is desirable here to include a notice of it as it is one of the characteristic genera of the Indo-Pacific fauna.

1) *Oligometra intermedia* A. H. Clark, 1912.

Oligometrides A. H. Clark.

1. *Oligometrides adeonae* (Lamarck).

LAMARCK. Hist. nat. des animaux sans vertèbres, vol. 2, 1816, p. 535 (*Comatula adeonae*).
BELL. "Alert" Report, 1884, p. 156 (*Antedon adeonae* and *A. pinniformis*); p. 158, pl. 11, figs. A*a—c* (*Antedon bidens*).
DÖDERLEIN. Denkschr. der medicin.-naturwiss. Gesellsch. Jena, vol. 8, 1898, p. 476, pl. 36, figs. 3—3*d* (*Antedon bidens*).
A. H. CLARK. Zool. Anzeiger, vol. 34, 1909, N° 11/12, p. 368 (*Oligometra bidens*).
—— Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 255 (*Oligometra adeonae*).
—— The Recent Crinoids of Australia, 1911, p. 776 (*Oligometra adeonae*).
—— Crinoïds of the Indian Ocean, 1912, p. 175 (*Oligometra adeonae*).
—— Ann. and Mag. Nat. Hist., series 8, vol. 10, 1912, p. 40 (*Oligometra marginata*).
REICHENSPERGER. Abhandl. der Senck. Naturforsch. Ges., vol. 35, 1913, part 1, p. 105 (*Oligometra adeonae*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 37.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 105 (*Oligometra anisa*).

Stat. 273. Anchorage off Pulu Jedan, east coast of the Aru Islands (Pearl Banks). 13 Metres. 8 Ex.
Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 1 Ex.

The most perfect specimen from Stat. 273 may be described as follows;

The centrodorsal is small, discoidal, the dorsal pole papillose, 1.5 mm. to 2.0 mm. in diameter; the cirrus sockets are arranged in one and a partial second marginal rows.

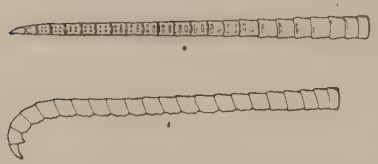


Fig. 6.
A cirrus from a specimen of *Oligometrides adeonae* from Stat. 273 viewed (*a*) dorsally and (*b*) laterally. × 5. (Courtesy of the U. S. National Museum).

The cirri are XVI, 20, about 10 mm. long; the cirrus segments are, from the third, fourth or fifth onward, about as long as broad; on the fourth or fifth and following two transverse ridges, a proximal and a distal, are developed, which in a lateral view appear as two small dorsal spines.

The 10 arms are about 50 mm. long; the ossicles of the IBr series and the first two brachials are broad, and are in close lateral apposition all along their edges. The IBr series and arm bases of this species are most strikingly similar to those of the species of *Tropiometra*.

P_1 is the longest and stoutest pinnule, 8 mm. long with 13 segments of which the first is slightly broader than long, the second is trapezoidal, tapering distally, slightly longer than the proximal (greater) width, the third is about twice as long as the proximal width, the fourth and fifth about three times as long as broad, and the remainder from two to two and one half times as long as broad; the pinnule tapers evenly from the base to the tip, and is distinctly prismatic, with the dorsal ridge rounded, for its whole length; P_2 is 6.5 mm. long with 12 segments, similar to P_1 but proportionately less stout; P_3 is 5.5 mm. long with 10 segments, similar to P_2; these three pinnules are considerably stiffened. P_4 is 4 mm. long with 12 segments of which the first is over twice as broad as long and the following gradually increase in length becoming about as long as broad on the fourth and twice as long as broad distally; the pinnule is slightly less stout basally than P_3 and tapers more rapidly; it is weak and not stiffened; the following pinnules have more numerous and shorter segments. P_{10} is 4.5 mm.

long with 17 segments which at first are short, becoming about as long as broad on the ninth or tenth. The distal pinnules are very slender, about 4.5 mm. long with 17 segments.

The colour is violet as far as about the sixth brachial, thence yellow with a narrow median line of white; the outer half or two thirds of the proximal pinnules is yellow.

An individual similar to the preceding, with arms 50 mm. and cirri 11 mm. long, is olive brown, gradually becoming yellow brown after the second syzygy; there is a narrow median line of white on the arm bases as far as the second syzygy.

Another is entirely deep violet with the ends of the cirri and pinnules yellowish.

A fourth example is deep purple with narrow yellow bands on the arms and a more or less obsolete narrow mediodorsal line of yellow on the arm bases.

A fifth is purple with large white blotches on the arms and a fine white mediodorsal line.

Still another is entirely orange yellow.

The remaining two resemble one or other of the preceding.

The specimen from Stat. 305 I at first believed was a new species, and I therefore described it under the name of *marginata*; further study has convinced me that it is merely a young specimen of *adeonae*.

Its characters are as follows:

The dorsal pole of the centrodorsal is papillose.

The cirri are XV, 15—16, 7 mm. long; the first segment is short, the following gradually increasing in length to the fourth, fifth or sixth which, with the following is about as long as broad. The cirri are moderately stout; the third and following segments have a strong transverse ridge near the proximal dorsal margin; this ridge is prominent and high, with a finely serrate crest; it lies about one third of the distance between the proximal and distal margins of the segments; in the proximal half or three quarters of the cirri the distal dorsal edge of the segments is more or less everted so that there is the same bidentate appearance as in typical examples of *àdeonae*; on the earlier segments this eversion may be nearly as high as the transverse ridge, but it soon decreases in height and disappears in the outer half or quarter of the cirri; the segments of the smaller cirri are quite without it.

The proximal arm structure resembles that in typical examples of *adeonae*; the ossicles of the IBr series and the first two brachials are broad, and are in lateral contact through produced and flange-like ventrolateral borders the outer edges of which are parallel to the longitudinal axis of the segments which bear them. The arms are 30 mm. long.

P_1 is 5.0 mm. long with 9 segments of which the first is about one third broader than long, the second slightly trapezoidal, half again as long as the proximal diameter, the third about three times as long as the proximal diameter, the fourth-sixth slightly longer, and the following rapidly diminishing in length to the small terminal segments; the pinnule is rather slender, but much stiffened; the second-fourth segments are slightly constricted centrally. P_2 is 4 mm. long with 9 segments, similar to P_1 but very slightly stouter and with the component segments slightly shorter. P_3 is 2.5 mm. to 3.0 mm. long with 8 segments, more slender and less stiffened than the preceding. P_4 is 2 mm. long, small, slender and weak, with 8 or 9 segments; the next two pinnules are similar, and the following gradually become elongated,

reaching 4.5 mm. or 5.0 mm. distally with 13 segments of which the majority are between two and three times as long as broad.

The colour, as preserved, is white.

Cotylometra A. H. Clark.

Key to the Species of the Genus Cotylometra.

a¹ The ossicles of the IBr series and the brachials in the proximal third of the arm each bear a narrow rounded median keel which on the first brachial may be reduced to a prominent tubercle; the outer edges of the ossicles of the division series and the first two brachials are bordered with a row of thickly set tubercles or small spines (Philippine Islands) . . . . . *ornata*

a² No keel on the IBr series and arms; edges of the ossicles of the IBr series and first two brachials unmodified (Andaman to the Lesser Sunda and Philippine Islands) . . . . . *gracilicirra*

1. *Cotylometra gracilicirra* (A. H. Clark).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 52, 1908, part 2, p. 221 (*Oligometra gracilicirra*).
—— Crinoids of the Indian Ocean, 1912, p. 168, fig. 26, p. 169 (*Oligometra gracilicirra*).

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. Near Kei Islands. 90 Metres. 2 Ex.
Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 2 Ex.

The examples from Stat. 260 are both small, with an arm length of 40 mm.; in one the cirri have 31—36 segments, and P_2 has 12—13 (usually the latter) segments; P_a is absent from all the arms; in the other P_a is present.

One of the specimens from Stat. 305 has the arms 80 mm. long and the cirri IX (with a few undeveloped), 28—31, 15 mm. long; P_2 has 10 segments. The other has arms 85 mm. long. P_a is absent.

These specimens agree perfectly with the type, even in the details of the colouration; they are, however, slightly larger.

Oligometra A. H. Clark.

Key to the Species of the Genus Oligometra.

a¹ The distal edges of the brachials in the proximal third of the arm are prominently everted

b¹ the distal edges of the brachials in the proximal third of the arm are turned abruptly outward and greatly produced; their crest is scalloped and irregular; proximal to the second syzygy this eversion becomes restricted to the central portion of the distal edge of the ossicles, and may be more or less resolved into high tubercles or blunt spines; the synarthrial tubercles are strongly

produced and usually bear prominent tubercles or blunt spines; the anterior angle of the axillary is usually produced dorsalward, or bears three prominent tubercles; the lateral processes on the segments of P_2 are very high and broad, usually with a truncated distal angle; P_1, though much smaller than P_2, bears similar lateral processes on its segments (northeastern Ceylon) . . . . . *erinacea*

b^2 no modification of the edges of the ossicles of the IBr series or of the first few brachials; ossicles of P_2 with very slight, those of P_1 with no, lateral processes (? Tranquebar, India) . . . . . *imbricata*

a^2 the distal edges of the brachials in the proximal third of the arm are not everted

b^1 P_2 very stout, composed of very short segments of which not more than three or four of the terminal are longer than broad, bearing very long lateral processes; these lateral processes along the outer ridge of the pinnule are uniform in character, narrowly triangular with a blunt apex, separated from each other by spaces of approximately their own size and shape, in the outer half of the pinnule being more than half the diameter of the segments which bear them in height; along the distal ridge the lateral processes on the first four or five segments are high keels with the crest parallel to the longitudinal axis of the pinnule, beyond that point resembling the processes of the outer crest; though much smaller and weaker, P_1 more or less resembles P_2, and P_3, though also smaller, may resemble P_2 (northern Australia and the Aru Islands) . . . . . *carpenteri*

b^2 P_2, though markedly longer and stouter than P_1 or P_3, is much less enlarged, the segments beyond the third being as long as, or longer than, broad

c^1 the segments of the enlarged lower pinnules bear lateral processes consisting of a rounded-triangular fin-like production of the prismatic ridges near the distal ends

d^1 the lateral processes on the segments of the proximal pinnules are extravagantly developed (Red Sea) . . . . . *electrae*

d^2 the lateral processes on the segments of the proximal pinnules are not extravagantly developed

e^1 the lateral processes on the segments of the proximal pinnules are moderately developed (Ceylon, and eastward to the Malay Archipelago, New Guinea and the Philippines) . . *serripinna* [1])

e^2 the lateral processes on the segments of the proximal pinnules are greatly reduced, almost obsolete, usually bearing a tuft of small spines

f^1 proximal pinnules not carinate; 17—22 (usually 19—20) cirrus segments (southeastern Africa and Cargados Carajos) *occidentalis*

1) Synonyms *pulchella* and *concinna* A. H. Clark.

f^2 second-fourth segment of proximal pinnules carinate; 23—24 cirrus segments (Fuchow, China) . . . . . *chinensis*

c^2 the segments of the enlarged proximal pinnules are unmodified, or have the distal edges slightly produced and spinous

d^1 P_2 with 12 smooth segments; P_3 about as long as P_2, and similar to it; cirri arranged in two rows on the centrodorsal (southern Japan). *japonica*

d^2 P_2 with 15—23 segments, which are smooth, or have slightly spinous distal ends; P_3 shorter than P_1 (and P_2); cirri arranged in a single row on the centrodorsal (New Caledonia and the Tonga Islands) *caledoniae*

1. *Oligometra carpenteri* (Bell).

BELL. "Alert" Report, 1884, p. 156 (*Antedon milberti*, part); p. 157 (*Antedon carpenteri*).
—— Proc. Zoöl. Soc. London, 1894, p. 394 (*Antedon milberti*, part; *Antedon serripinna*).
A. H. CLARK. Recent Crinoids of Australia, 1911, p. 775.
—— Die Fauna Südwest-Australians, vol. 3, 1911, part 13, p. 441, 443, 444, 446.
—— Crinoids of the Indian Ocean, 1912, p. 174.
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p 37.

Stat. 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. 4 Ex.
Stat. 274. 5° 28′.2 S., 134° 53′.9 E. Near Jedan Islands, eastern coast of Aru Islands. 57 Metres. 2 Ex.

All of these specimens are similar, with arms about 50 mm. long.

2. *Oligometra serripinna* (P. H. Carpenter).

P. H. CARPENTER. Notes from the Leyden Museum, vol. 3, 1881, p. 182 (*Antedon serripinna*).
HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 82, pl. 5, fig. 48 (the specimens described represent *O. caledoniae*).
BELL. Proc. Zoöl. Soc. London, 1894, p. 396 (*Antedon carinata*).
A. H. CLARK. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 226 (*Oligometra pulchella*).
—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 222 (*Oligometra pulchella*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 399 (*Oligometra pulchella*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 179.
—— Proc. U. S. Nat. Mus., vol. 40, 1911, p. 33 (under *Oligometra serripinna* var. *occidentalis*).
—— Notes from the Leyden Museum, vol. 33, 1911, p. 189.
—— Crinoids of the Indian Ocean, 1912, pp. 169—174, fig. 28, p. 171.
—— Records of the Indian Museum, vol. 7, 1912, part 3, N° 26, p. 270.
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 27.
—— Proc. Biol. Soc. Washington, vol. 26, 1913, p. 182.
REICHENSPERGER. Abhandl. der Senck. naturforsch. Ges., vol. 35, 1913, Heft 1, p. 105.
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 38.

Stat. 164. 1° 42′.5 S., 130° 47′.5 E. Between New Guinea and Misool. 32 Metres. 1 Ex.
Stat. 258. Tual Anchorage, Kei Islands. 22 Metres. 1 Ex.

From Stat. 164 there is one specimen with arms 50 mm. long; P_2 is greatly enlarged with strongly marked processes; P_3 is small, like P_4.

The specimen from Stat. 258 has rather slender cirri with 16—17 segments which beyond the eighth are about as long as broad. P_2 is much enlarged, much larger than the other pinnules, composed of 17 segments most of which are about as long as broad, 7 mm. long; the lateral processes are small and narrow (antero-distally) and are armed with fine spines; the other proximal pinnules have the segments with spinous distal ends; P_a is absent on all the arms of three rays, six in all. This individual approaches the African *occidentalis*.

VII. Family Tropiometridae A. H. Clark.

Tropiometra A. H. Clark.

Key to the Species of the Genus Tropiometra.

a¹ Size large; arms 170 mm. to 230 mm. (usually over 200 mm.) long; no carinate processes on the brachials
- b¹ cirri large and massive, 40 mm. to 50 mm. long, with usually 35—40 segments (southern Japan) . . . . . *macrodiscus*
- b² cirri smaller and less massive, 30 mm. to 45 mm. (usually less than 40 mm.) long, with 30—35 (usually 30—33) segments (Australia, except the southern coast, to northwestern Papua) . . . *afra*

a² Size small; arm less than 140 mm. long; each brachial bears a prominent narrow median carinate process
- b¹ cirrus segments very short, more than twice as broad as long
  - c¹ less than XXVI cirri
    - d¹ cirri XVI, 18; proximal pinnules very stiff, some of them armed with spine-like tips (Red Sea) . . . . . *audouini*
    - d² cirri usually about XX, with 22—23 segments; proximal pinnules not stiffened (southern and southeastern Africa, Madagascar, and the islands in the southwestern Indian Ocean) . . . . . *carinata*
  - c² cirri XXVI—XXIX, 23—26; proximal pinnules stiffened (Ceylon and southern India, and eastward to Oceania). . . *indica*
- b² cirrus segments longer, in the outer half or two thirds of the cirri much less than twice as broad as long
  - c¹ cirri large and stout; carination of the brachials very low, often scarcely noticeable (east coast of India, and eastward to "East Asia") . . . . . *encrinus*
  - c² cirri smaller and less stout; carination of the brachials high and very prominent, sometimes greatly exaggerated (Venezuela and the southern Caribbean Sea, and southward to southern Brazil) . . . . . *picta*

1. *Tropiometra afra* (Hartlaub).

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1890, N° 1, p. 86, Taf. 5, Fig. 50, 52 (*Antedon afra*).
A. H. CLARK. Proc. U. S. Nat. Mus., vol. 34, 1908, p. 315 (specimen from the South Pacific, but not those from Japan).
—— The Recent Crinoids of Australia, 1911, p. 780.
— — Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 28.
—— Records of the Western Australian Museum, vol. 1, 1914, part. 3, p. 125.
H. L. CLARK. Carnegie Institution of Washington Publication N° 212, 1915, p. 106.

" Stat. 164. 1°42'.5 S., 130°47'.5 E. Between New Guinea and Misool. 32 Metres. 1 Ex.

The centrodorsal is thick-discoidal, the broad dorsal pole slightly concave, 9 mm. in diameter. The cirri are XXVII, 33—35, 35 mm. to 45 mm. long. The diameter of the animal at the level of the third brachial is about 27 mm. The colour is violet, with large blotches of light yellow.

This specimen agrees with others at hand from Australia.

VIII. Family CALOMETRIDAE A. H. Clark.

Neometra A. H. Clark.

Key to the Species of the Genus Neometra.

a^1 Dorsal processes on the outer cirrus segments triple, consisting of a median carination with a dorsolateral keel on either side of it; usually about 40 arms
  b^1 cirri XV, 31—36, rather slender, about 25 mm. long (one third of the arm length); dorsolateral processes much lower than the median keel, developed only toward the tip of the cirrus; division series with everted borders, and cirrus segments and brachials with produced distal edges, giving the animal a very rough aspect (Lesser Sunda Islands). . . . . *sibogae*
  b^2 cirri XVII—XIX, 39—50, very stout, 35 mm. to 45 mm. (usually about 40 mm.) long; dorsolateral processes but little shorter and lower than the median keel, developed from the 15th segment onward; division series, brachials and cirrus segments with unmodified distal edges, so that the animal appears smooth (west coast of Australia). . . . . *gorgonia*

a^2 Dorsal processes on the outer cirrus segments consisting of a median keel only; 30 or fewer arms
  b^1 30 arms; midventral line of the cirri sharp (Philippine Islands) . . *acanthaster*
  b^2 20 or fewer arms; cirri ventrally rounded
    c^1 cirri long, nearly half the arm length; longest cirrus segments twice as long as broad; synarthrial tubercles very high and prominent, as high as broad at the base; 16—17 arms; 42—50 cirrus segments (Lesser Sunda Islands) . . . . . *diana*

c^2 cirri shorter, not more than one third of the arm length; longest cirrus segments not longer than broad; synarthrial tubercles not developed

d^1 35 cirrus segments; 20 arms (southern Japan) . . . . . *multicolor*

d^2 39—55 cirrus segments

e^1 cirri slender and short, less than one fifth of the arm length, with 42—55 segments; 20 arms (Andaman Islands) . . . . . *spinosissima*

e^2 cirri longer, one fourth to one third of the arm length; 39—46 cirrus segments

f^1 arms very narrow; distal edges of the brachials rather strongly produced; distal edges of the cirrus segments prominent; cirri more than one third of the arm length, and rather slender; first segment of P_1 with a high rounded dorsal process, and from half again to twice as broad as the second; first segment of P_2 with a prominent high dorsal process; 15—20 arms (Philippine and Lesser Sunda Islands). . . . . *alecto*

f^2 arms broader and more rounded dorsally; distal edges of the brachials less produced; cirri less than one third of the arm length, and stouter, the distal edges of the segments not modified; first segment of P_1 not produced dorsally, and only slightly broader than the second; first segment of P_2 without a dorsal process; 20 arms (western Australia) . . . . . *conaminis*

1. *Neometra diana* A. H. Clark.

A. H. Clark. Zool. Anzeiger, Bd. 39, 1912, N° 11/12, p. 422 (*Calometra diana*).

Stat. 260. 5° 36′.5 S., 132° 55′.2 E. North of Kei Island. 90 Metres. 1 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. South of Timor. 73 Metres. 11 Ex.

The centrodorsal is thin discoidal, the flat dorsal pole 3.5 mm. in diameter; the cirrus sockets are arranged in a single fairly regular marginal row.

The cirri are XVI, 42—43, 30 mm. to 33 mm. long; the first segment is very short, the second nearly or quite twice as broad as long, the third half again as broad as long, the fourth from one third to one half again as long as broad, the fifth-tenth or -eleventh about twice as long as broad; the following very gradually decrease in length, beyond the eighteenth or twentieth being about as long as the proximal diameter, and the last fifteen or sixteen slightly broader than long; the cirri taper slightly at the tip so that the last three segments before the penultimate are as long as broad, or slightly longer; all of the segments have slightly produced and overlapping distal ends; the longer proximal segments are slightly constricted centrally; on the fourth or fifth a slight subterminal tubercle appears which very slowly increases in size and involves more and more of the dorsal surface of the segments so that the short outer segments possess the high carinate spines characteristic of the species of the family. As a whole the cirri are rather slender, and resemble those of *Calometra discoidea*.

The radials are short in the median line, but extend upward in the angles of the calyx where they form a broad process with parallel sides and a straight or convex distal border which entirely and widely separates the bases of the IBr_1. In width this anterior process from the radials is equal to about one half of the length of the ventrolateral edge of the IBr_1.

The IBr_1 are oblong, nearly or quite three times as broad as long, with the ventrolateral edge produced into a thin flange-like border with a smooth outer edge which is about twice as wide proximally as distally; the proximal end is even with the edge of the interradial process. The IBr_2 (axillaries) are broadly pentagonal, not quite twice as broad as long; the dorsal surface is slightly excavated so that the distal borders appear prominent; the thin produced ventrolateral edge of the IBr_1 is continued on to the IBr_2 where, viewed ventrally it is seen to have its sides parallel, while viewed dorsally it disappears under the lateral angles of the axillary. The IIBr series are 2. At each synarthry there is a high and prominent tubercle which in height is approximately equal to the longer (longitudinal) diameter of its base. These synarthrial tubercles recall those of *Perometra diomedeae*, but they are proportionately narrower and more slender than those of that species, though nearly as high.. The IBr_1 sometimes has a small rounded tubercle just anterior to the proximal half of the synarthrial tubercle; the IBr axillary has a more or less prominent narrow rounded median carination running anteriorly from the base of the distal half of the synarthrial tubercle, often terminating, approximately on a level with the lateral angles, in a prominent tubercle; these are repeated on the ossicles of the IIBr series and on the first two brachials.

The arms are 16 or 17 in number in fully grown examples, about 70 mm. long. The brachials are essentially like those of *Neometra multicolor*, but each bears a prominent low narrow rounded carination which ends distally in a more or less spinous production of the distal edge; this carination lies on the opposite side of succeeding brachials, especially in the proximal portion of the arm.

P_1 is 10 mm. long, slender and weak, composed of 28—33 segments of which the first two are enormously enlarged and the remainder very small and about as long as broad; the first segment is irregularly rounded wedge-shaped, about two and one half times as broad as long, about as broad as the lateral diameter of the brachial which bears it; the distal portion of the segment consists of a broad rounded carinate process about as high as the maximum diameter of the ossicle; the second segment is about three fifths as broad as the first, and narrow, between four and five times as broad as the maximum (distal) length; the distal border is strongly rounded; the third segment is about as long as broad, and occupies the median third of the distal margin of the second. P_2 is long, stiff and spine-like, though rather slender, 13 mm. to 15 mm. long, with 18—22 segments of which the first is much enlarged with a high evenly rounded distal process, the second is smaller, trapezoidal, about twice as broad as long with a carinate process having a straight instead of a rounded distal border, the third is slightly longer than broad with a small more or less irregular carinate process usually occupying only a portion of the distal edge; the first segment is not so large as the first segment of P_1, and the second is longer than the corresponding segment of P_1; the third segment is about half as broad as the second; after the third the segments increase in length so that the sixth

is about twice as long as broad, the ninth or tenth about three times as long as broad, and the distal slightly longer; the third and following have a distinct, though low and faint, median carination, and are slightly constricted centrally with prominent distal ends which project at the prismatic angles in the form of short spines. P_3 is 17 mm. long with 20 segments, resembling P_2 but slightly stouter and with more elongated segments of which the first two are only slightly enlarged, and the third has a larger carinate process than the corresponding segment of P_2; the dorsal carination is also more prominent; P_4 on the arms arising from the IIBr axillaries is slightly larger and stouter than P_3, but similar to it; the first segment is not enlarged, though distally it is roundedly carinate; the second segment is about as broad basally as the proximal (greater) length, and is slightly carinate distally; the dorsal carination of the pinnule resembles that of P_3. On the arms arising from the IBr axillaries P_4 is 11 mm. long, similar to P_3 but smaller and more slender. P_5 is 8 mm. long and resembles P_4 but tapers more evenly and rapidly; the first segment is without a distal carinate process. The genital pinnules have the third-sixth segments with produced ventral edges protecting the genital glands; this production of the ventral edges reaches a maximum on the fourth, thence decreasing more gradually distally. The distal pinnules are 10 mm. long with 15 segments.

The disk is completely covered with a solid pavement of plates as in the other species of the genus. In the perisomic angles about the mouth are five prominent though small orals, probably of perisomic origin, each of which typically has at each proximal angle a large oblong plate continuing it outward.

The colour is light purple, the cirri and pinnules white.

Another large specimen resembling the preceding has 17 arms about 70 mm. long; the IIBr series are absent on one ray, and on one half of another ray; the cirri are XVI, 42—50, 25 mm. to 28 mm. long; P_2 and P_3 may have a narrow irregular dentate carination on the fourth-fifth or fourth-sixth segments. Of the remaining examples one has 13 arms 60 mm. long; one has 10 arms 55 mm. long; one has 11 arms 45 mm. long; one has 10 arms 35 mm. long; one has 11 arms 30 mm. long, and one has 11 arms 25 mm. long; of the three remaining, which are very small, one has 13 and one 12 arms.

The specimen from Stat. 260 has 16 arms 45 mm. long; there are 42 segments in the cirri.

2. *Neometra sibogae* A. H. Clark.

A. H. Clark. Zool. Anzeiger, Bd. 39, 1912, N° 11/12, p. 421.

Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 4 Ex.

Centrodorsal thin discoidal, the broad polar area flat, 4 mm. in diameter; cirrus sockets arranged in a single fairly regular marginal row.

Cirri XV, 31—36, about 25 mm. long, large and stout; their bases are crowded against those of the adjacent cirri, and the first segments are more or less sharply flattened laterally; the first two segments are about twice as broad as long, the following gradually increasing in

length and becoming nearly, sometimes quite, as long as broad on the fifth; the next two or three are similar; the following very gradually decrease in length so that those in the outer fourth of the cirri are about twice as broad as long; in their outer fourth of fifth the cirri taper very gradually so that the tip is comparatively slender. The distal edges of the segments all around are everted and prominently overlapping. From the tenth segment onward there is evident a carination of the mid-dorsal line, at first affecting only the distal part of the segments but soon rising into a high sharp keel occupying the entire length of the dorsal surface, the crest of which is parallel to the long axis of the cirri. In the distal portion of the cirri, beginning on the tenth-eighteenth (usually on the fourteenth or fifteenth) segment before the terminal claw a small tubercle appears on either side of the median carination near the lateral borders of the segments as viewed dorsally; these tubercles rapidly elongate and develop into supplementary keels parallel to the median keel and similar to it, but lower.

The radials are even with the edge of the centrodorsal in the median line, but are strongly produced in the angles of the calyx where they separate widely the bases of the IBr_1; the ventral edge of this anterior process, which is straight and not spatulate nor otherwise modified, is equal in length to the lateral edges of the IBr_1; the cirrus sockets are more or less supported by the radials as in *Oreometra mariae*.

The arms are from 30 to 40 in number, 70 mm. to 75 mm. long, arranged in 2, 1, 1, 2 or 2, 2, 2, 2 order; some rays may bear as many as nine arms in which case, as in all cases, the extra axillary is external; the division series extend themselves horizontally from the centrodorsal (that is, at right angles to the dorsoventral axis of the animal) and are very widely separated; all of the division series are 2; they are very narrow and strongly rounded; the extreme ventrolateral border of the ossicles of the division series is produced into a thin flange with a smooth and thin outer border which runs from the distal edge of the interradial production of the radials along the sides of the ray as far as the second brachial; but this is only visible dorsally as far as the IBr axillary; from the ends of the interradial processes from the radials these flanges are (viewed ventrally) perfectly parallel as far as the IIBr axillary, but as the IIBr series make a very considerable angle with each other the flanges necessarily disappear from dorsal view at the IBr axillary. The union of the ossicles of the IBr series is extremely close, appearing like a syzygy, but the union of the ossicles of the other division series is not so modified. The proximal and distal borders of the ossicles of the division series, including the distal borders of the IBr axillary, are prominently everted, but smooth and not spinous, giving the division series a singularly and characteristically rugged appearance.

The arms resemble those of *N. multicolor*, the brachials after the eighth or ninth being about as long as broad, triangular, with the outer edge somewhat convex; the distal edges of the brachials are produced, thin, and finely spinous, this production being highest on the side bearing the pinnule (toward the longer side) where it begins abruptly; in the outer part of the arm it gradually becomes less and less marked, beginning less and less abruptly.

Syzygies occur between brachials $3+4$, $11+12$ to $15+16$ (usually $11+12$ or $12+13$), and again after 4 oblique muscular articulations; the distal intersyzygial interval is 3 oblique muscular articulations.

P_1 is from 10 mm. to 11 mm. long, composed of 29 segments, slender, but not so weak as is usual in the genus, and more or less stiffened; the first two segments are enormously enlarged, subequal, three to four times as broad as long, and nearly twice as large as the corresponding segments on P_2; the third segment occupies about one third of the median distal border of the second, and is about as broad as long; the following segments are slightly longer than broad, becoming about as long as broad in the distal half of the pinnule. P_a is very small and weak, not half so long as P_1; on the inner arms P_1 resembles P_a, and on the outer side of the IIBr series it is intermediate between P_a and P_1. P_2 is 11 mm. to 12 mm. long, with 18—21 segments of which the fourth and following are about twice as long as broad; the pinnule is straight and stiff, but not particularly enlarged; the first segment is about three times as broad as the median length, about twice as broad basally as the third; the second is of about the same length, but is not quite so broad; it bears a slight rounded carinate dorsal process; the third is about half again as long as broad. On the inner arms P_2 is the longest. On the outer arms P_3 is 15 mm. long with 17 segments which are more elongate than those of P_2, nearly or quite three times as long as broad; the pinnule is similar to P_2 but very slightly stouter, and the second segment has the carinate process much reduced; the first and second segments are not quite so much enlarged, in fact scarcely enlarged at all; the third segment is narrowly carinate, at least basally. P_4 is 11 mm. long with 15 segments, those beyond the third much elongated; the second-fourth are slightly carinate. P_5 is 9 mm. long with 13 segments, resembling P_4, but the component segments are not quite so long; there is a slight production of the distal dorsal border of the outer segments on P_4, which increases on P_5 and P_6. P_6 is 7 mm. long with 13 segments, resembling P_5. P_7 is 5 mm. long. P_7 and P_8 become stouter and more sharply prismatic than the preceding, which are rounded prismatic. The distal pinnules are rather slender, 8 mm. long with 16 segments of which the terminal five are suddenly and disproportionately small and short.

The disk is lacking in all the specimens; the side- and covering-plates are highly developed as in the other species of the genus.

The colour is sulphur yellow, crossed on the arms and cirri with numerous narrow purple bands, or yellow, the pinnules with narrow purple bands.

This species has the broad and patent habit characteristic of the many armed species of such genera as *Comanthus*. The centrodorsal is thin, but very broad, and bears about its margin a regular row of stout strong cirri of which the proximal portions lie all in the same plane, the distal portions being recurved. The arms spread out horizontally from the calyx just as the cirri do from the centrodorsal, and so thin is the latter that the dorsal portion of the earlier division series rests upon and among the horizontal earlier portions of the cirri. The eversion of the borders of the ossicles of the division series and of the earlier brachials suggests the general aspect of such species as *Pectinometra flavopurpurea*.

3. *Neometra alecto* (A. H. Clark).

A. H. Clark. Proc. U. S. Nat. Mus., vol. 39, 1911, p. 544 (*Calometra alecto*).
—— Records of the Western Australian Museum, vol. 1, 1914, N° 3, p. 130.

Stat. 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. 1 Ex.

There are apparently 20 arms (12 on the three rays preserved) about 70 mm. long. The cirri are XVII. One cirrus, not quite full size, with 39 segments remains. This example agrees well with specimens from the Philippine Islands.

Pectinometra A. H. Clark.

Key to the Species of the Genus Pectinometra.

a^1 Ossicles of the division series and first two brachials with no trace of median carination, rugose on the dorsal surface, and with finely crenulate edges which are not everted; cirri X—XV, 26—40 (usually 34—36); 15—20 arms (Philippine Islands). . . . . *carduum*

a^2 Ossicles of the IBr series with a prominent high median keel; a similar but much less developed (sometimes obsolete) keel on the ossicles of the IIBr series and the first two brachials; the edges of the ossicles of the division series may be everted, but are never crenulate; usually 20 arms

b^1 cirri with 41—48 segments; keel on the ossicles of the IBr series very high and prominent, especially proximally; edges of the ossicles of the division series only slightly or not at all everted (Malay Archipelago and the Lesser Sunda Islands) . . . . . *magnifica*

b^2 cirri with 30 segments; keel on the ossicles of the IBr series lower and more uniform in height; edges of the ossicles of the division series prominently everted (southern Japan) . . . . . *flavopurpurea*

1. *Pectinometra magnifica* (A. H. Clark).

A. H. Clark. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 77 (*Calometra magnifica*).
—— The Crinoids of the Indian Ocean, 1912, p. 185, fig. 31, p. 186.

Stat. 94. 5° 11′.2 N., 119° 35′.4 E. Sulu Sea. 450 Metres. 1 Ex.

This specimen may be described as follows:

The centrodorsal is very small, apparently truncated conical, the dorsal pole very slightly convex, obscurely tubercular, 1.5 mm. in diameter; the cirrus sockets are arranged in ten columns of two, more rarely three, each.

The cirri are XXII, 37—40 (usually 37), 28 mm. to 32 mm. long; the segments gradually increase in length to the sixth, which is about as long as broad, and after the ninth gradually decrease so that after the nineteenth they become about twice as broad as long; the terminal fifteen to eighteen segments taper gradually so that the last few segments are very small; all the segments have slightly overlapping ventral distal ends; after about the ninth segment the distal dorsal ends of the segments become prominent, and in the outer half of the cirri the segments bear the characteristic high dorsal keels.

The ends of the basal rays are visible as prominent rounded dorsoventrally elongate tubercles in the angles of the calyx.

The distal borders of the radials are just visible beyond the edge of the centrodorsal; they are strongly concave, curving upward over the ends of the basal rays and meeting just above them in the angles of the calyx; they are slightly produced outward, and are continued upward into very narrow interradial processes which entirely separate the IBr_1.

The IBr_1 are very short, chevron shaped, slightly less in median than in lateral length; the proximal edge is slightly swollen, the lateral edges slightly turned outward, straight, with a low blunt tubercle at the distal and proximal angles and sometimes a second near the former; the median line of the ossicle is occupied by a very high narrowly rounded crest, which is much higher proximally than distally. The IBr_2 (axillaries) are irregularly rhombic, not quite twice as broad as long, with the distal and lateral angles rather strongly produced; the proximal half of the median line bears a narrowly rounded crest which is much lower than that on the IBr_1; this crest posteriorly is of the same height as the anterior end of the crest on the IBr_1 which it adjoins; anteriorly it sinks gradually downward to the level of the general dorsal surface of the ossicle; the proximal borders of the IBr_2 are, except laterally, slightly thickened and produced over the distal borders of the IBr_1, and coarsely and obscurely scalloped; the distal edges are slightly everted, but not otherwise modified.

The IIBr series are 2, resembling the IBr series but without any trace of carination or modification of the proximal or distal borders; the $IIBr_1$ bears a broad ventrolateral process, at the base nearly as wide as the segment, in height equal to about half the distance from the lateral margin to the median line, outwardly rounded, sometimes with one or two coarse low processes or blunt tubercles.

The 20 arms, which are 70 mm. long from the border of the radials, resemble those of the other species of the genus; the brachials have rather prominent finely spinous distal ends.

This individual only differs from the type of *P. magnifica* (which is before me) in the greater development of the keel on the IBr_1, in the very faint keel on the IIBr series, and in the slightly longer proximal cirrus segments. It is undoubtedly a young example of that species.

A third specimen of this interesting form was dredged by the "Albatross" at Stat. 5661, in 180 fathoms in the Flores Sea (Cat. N° 35972 U. S. Nat. Mus.).

IX. Family Thalassometridae A. H. Clark.

Key to the Subfamilies of the Family Thalassometridae.

a^1	P_1 shorter and smaller than P_2, but similar to it (southern coast of Australia northward to southern Japan; 11—252 Metres).	Ptilometrinae
a^2	P_1 larger and longer than P_2 (Caribbean Sea and the Bay of Biscay southward to Ascension and Tristan da	

Cunha; Socotra to South Africa and the Crozet Islands, and eastward to the Kermadec, Galapagos, Hawaiian and western Aleutian Islands, and southern Japan; littoral, and down to 2926 Metres) . . . . . Thalassometrinae

1st Subfamily Ptilometrinae A. H. Clark.

Key to the Genera of the Subfamily Ptilometrinae.

a¹ Centrodorsal large and broad, thick discoidal or columnal, the numerous cirri closely crowded and irregularly distributed, though tending to arrange themselves in fifteen columns; the radial areas of the centrodorsal are never differentiated (southwestern, southern, and southeastern Australia) **Ptilometra**

a² Centrodorsal a short, more or less pentagonal, column, with a conical apex; the comparatively few cirri are arranged in ten definite columns, two to each radial area; the radial areas are separated from each other by more or less developed ridges

b¹ 10—13 arms; the pinnules in the proximal third of the arm are much shorter than those in the distal half, and are composed of segments which, except occasionally at the extreme tip, do not have overlapping and spinous distal ends; the longer proximal cirrus segments have approximately straight ventral and dorsal borders (as viewed laterally) which are usually parallel, though they may diverge very slightly distally; there is no central constriction, or production of the distal edge (Lesser Sunda Islands to southwestern Japan). . . . . **Asterometra**

b² 20—30 arms; the pinnules in the proximal third of the arm are as long as, or even longer than, those in the distal half, and are composed of segments many or most of which are constricted centrally with produced and spinous distal ends; the longer proximal cirrus segments are usually more or less constricted centrally with prominent distal ends the ventral border of which usually more or less overlaps the base of the succeeding segment, and may be produced into a long ventral spine (Gulf of Martaban to northern Celebes and the Philippine Islands). . . . . **Pterometra**

Asterometra A. H. Clark.

Key to the Species of the Genus Asterometra.

a¹ Elements of the IBr series and first two brachials without prominent median keels or tubercles

b¹ centrodorsal small and conical (Formosa) . . . . . *lepida*

b² centrodorsal large, columnar, with a conical apex

c[1] cirri longer than the arms, composed of 100—120 segments; an indistinct narrow line sometimes traceable on the elements of the IBr series and the first two brachials indicates an incipient median keel (southwestern Japan) . . . . . *macropoda*

c[2] cirri about three fourths as long as the arms, composed of 80—90 segments; arms 80 mm. long

d[1] distal pinnules 9 mm. long, with the outer segments not more than twice as long as broad; overlapping spines on the outer brachials long, strongly curved, and sharp pointed; a rounded median tubercle on the radials; central portion of the elements of the IBr series and first two brachials swollen, but with no indication of a median line (southwestern Japan) . . . *anthus*

d[2] distal pinnules 13 mm. long, with the outer segments three times as long as broad, or even longer; overlapping spines on the outer brachials short, not much curved, more or less blunt; radials with a dorsoventrally elongate tubercle; IBr series with a faint low median carination (Sahul Bank). . . . . *acerba*

a[2] Elements of the IBr series and first two brachials with prominent median keels or tubercles

b[1] elements of the IBr series and first two brachials with a very high and continuous narrow median keel

c[1] the keels on the elements of the IBr series and first two brachials are strongly convex in profile view, so that the outline of the lower part of the animal is formed by a series of convex scallops (Sahul Bank to Timor and the Kei Islands) . . . . . *mirifica*

c[2] the crest of the keels on the elements of the IBr series and first two brachials is straight, parallel with the longitudinal axis of the segments; cirri XX, 77—86, 60 mm. to 65 mm. long; arms 100 mm. long (Philippine Islands) . . . . . *cristata*

b[2] the IBr_1 bears a slightly elongated sharp median tubercle, or a short median ridge; the axillary bears three sharp tubercles; the first two brachials each bear a sharp prominent tubercle; cirri XX, 80, 80 mm. long; arms 100 mm. long (Kei Islands) . . . . . *longicirra*

1. *Asterometra mirifica* A. H. Clark.

Bell. Journ. Linn. Soc. (Zoöl.), vol. 24, 1893, p. 339 (*Antedon longicirra*, part).
A. H. Clark. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 146 (*Asterometra mirifica*).
—— Crinoids of the Indian Ocean, 1912, p. 190, fig 33, p. 192 (*Asterometra mirifica*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N[o] 15, p. 43 (*Asterometra mirifica*).

Stat. 260. 2.3 miles N. 63° W. from the northern point of Nuhu Jaan, Kei Islands. 90 Metres. 3 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. Timor Sea. 73 Metres. 5 Ex.

From Stat. 260 there are two very small specimens, and one nearly of full size; the latter resembles the type from the Sahul Bank very closely; the arms are 70 mm. long; the cirri, which are composed of 87—89 segments, are from 70 mm. to 75 mm. long.

The material from Stat. 294 consists of five very small specimens, and a few cirri from larger examples.

The keels on the elements of the IBr series and on the first two brachials are considerably higher in this species than in *A. cristata*.

2. *Asterometra longicirra* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 103, pl. 17 (*Antedon longicirra*).
HAMANN. Bronn's Klassen und Ordnungen des Tier-Reichs, vol. 2, 1907, Abt. 3, p. 1578 (*Antedon longicirra*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 359 (*Ptilometra longicirra*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 147 (*Asterometra longicirra*; compared with *A. mirifica*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 182 (*Asterometra longicirra*; compared with *A. lepida*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 547 (*Asterometra longicirra*; compared with *A. cristata*).
—— Crinoids of the Indian Ocean, 1912, p. 190 (*Asterometra longicirra*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 43 (*Asterometra longicirra*).

Stat. 260. 2.3 miles N. 63° W. from the northern point of Nuhu Jaan, Kei Islands. 90 Metres. 1 Ex.

The centrodorsal is columnar, 5.5 mm. in diameter at the base and 3 mm. in interradial height; the cirrus sockets are arranged in ten columns of two each; the columns of adjacent radial areas are close together, separated by a slightly marked irregular rounded ridge which in width is equal to from one half to one third the diameter of the adjacent sockets; the two columns of each radial area are separated in the midradial line by a slightly concave bare space equal in width to about one half the diameter of a cirrus socket; the dorsal pole is slightly concave, and is marked by five large, though low and obscure, tubercles as in the other species of the genus.

The cirri are about X, 87—98, 70 mm. to 80 mm. long, moderately slender; the longest proximal cirrus segments are about twice as long as broad.

The ends of the basal rays are prominent as small tubercles in the angles of the calyx.

The radials have a prominent median dorsoventrally elongated tubercle; the IBr_1 and the proximal third or half of the axillary bear a narrow low rounded median carination, on the former highest distally, on the latter highest proximally, the highest points being usually marked by a slight elevation in the general surface; traces of this are seen on the first two brachials. In some cases there is a tubercle toward the distal border of the IBr_1, and a similar tubercle toward the proximal border of the axillary, the latter with faint traces of broad tubercles anterior to and on either side of it; each of the first two brachials also bears a tubercle.

The arms are 105 mm. long.

This appears undoubtedly to be an undeveloped specimen of *A. longicirra*; the cirri are more slender than in the type, and are composed of relatively longer segments, and the ornamentation of the elements of the IBr series and first two brachials is scarcely more than indicated.

Pterometra A. H. Clark.

Key to the Species of the Genus Pterometra.

a¹ No ventral spines on the longer proximal cirrus segments; cirri numerous, XXX—XXXV, composed of 80—122 segments; 20 arms; no trace of carination on the division series

b¹ cirri excessively long and stout, from one fourth to one third again as long as the arms (100 mm. to 118 mm. long), composed of 109—122 segments; all ten columns of cirrus sockets closely crowded against each other; arms 90 mm. long (Philippine Islands) . . . . . *magnipeda*

b² cirri shorter and more slender, from three fourths to four fifths of the arm length (75 mm. to 80 mm. long), composed of 80—85 segments; columns of cirrus sockets separated interradially by a broad shallow groove, radially by a narrow flat bare area; arms 100 mm. long (Gulf of Martaban to Damar Island and the Philippines) . . *pulcherrima*

a² Longer proximal cirrus segments bearing on the midventral portion of the distal edge long sharp spines which extend over the bases of the succeeding segments; cirri XX—XXX (usually XX—XXV), composed of 70—113 segments; 20—30 (typically about 30) arms

b¹ proximal portion of the animal very broad, the division series and arms as far as the seventh brachial (at least) as seen in lateral view diverging rapidly, at an angle of approximately 90°; colour, in alcohol, uniform brown

c¹ cirri shorter, more numerous, and more slender, XXX, 86, 50 mm. long; arms 80 mm. long (Philippine Islands). . . . . *splendida*

c² cirri longer, less numerous, and stouter, XX—XXV, 99—113, 77 mm. long (northern Celebes) . . . . . *venusta*

b² proximal portion of the animal very narrow, the division series and arm bases as seen in lateral view diverging very slowly, at an angle of about 45°; colour in alcohol violet, blotched and variegated with white; 20—30 arms (Philippine Islands) . . . . . *trichopoda*

1. *Pterometra venusta* A. H. Clark.

A. H. Clark. Zool. Anzeiger, vol. 39, 1912, N⁰ 11/12, p. 424.

Stat. 117. Entrance to Kwandang Bay, Celebes. 80 Metres. 4 Ex.

The centrodorsal is thick discoidal or columnar, the sides nearly parallel, 6 mm. broad

at the base and 2.5 mm. high; the cirrus sockets are arranged in ten equally spaced columns, each column separated from its neighbours on either side by a shallow groove from one fourth to one third of a cirrus socket in width; there are two, more rarely three, cirrus sockets to a column; the dorsal pole of the centrodorsal bears a rosette of five prominent tubercles.

The cirri are XX—XXV, 99—113 (usually nearer the latter), 77 mm. long, stout basally and tapering slightly distally, though this distal taper is more gradual and therefore not so marked as in *Pterometra trichopoda*; the longest cirrus segments are from one third to one half again as long as broad; in the earlier segments the ventral distal edge is rather prominent; after the eighth the median portion begins to project, overlapping the base of the next succeeding segment, this after the eleventh or twelfth becoming a sharp ventral spine which persists as far as the twentieth, or even the twenty-third segment; at first this ventral spine makes a considerable angle with the longitudinal axis of the segments, but distally its outer part becomes more nearly parallel to it; the cirri are more broadly rounded ventrally than those of *Pt. trichopoda*, and there is no well developed sharp ridge or keel extending backward from the ventral spine along the midventral line of the segments; the dorsal processes arise very slowly, and are never very prominent; they first appear on about the twenty-third segment; the cirri are moderately compressed laterally, less so than in *Pt. trichopoda.*

The radials and division series resemble those of *Pterometra splendida*, but are slightly more robust.

The arms are from 22 to 28 in number, and resemble those of *Pt. splendida.*

In the type (which has 28 arms) P_1 is 10 mm. long with 18 segments of which the terminal four or five are abruptly smaller than the preceding; it is considerably stouter and more sharply triangular than P_1 in *Pt. trichopoda*; P_2 is 11.5 mm. long with 16 segments, strongly though not sharply triangular in section, tapering evenly to a slender tip; the outer segments are about twice as long as broad, without projecting distal edges; P_3 is 15 mm. or 16 mm. long with 16 segments of which those in the distal half are much elongated and slender, with prominent spines at the prismatic angles; P_4 is 17 mm. long with 15 segments, similar to P_3 but with a slightly more even taper and hence appearing stouter distally; P_5 is 17 mm. long with 14 segments, resembling P_4; P_6 is 16.5 mm. long with 14 segments, resembling P_5; P_7 is 18.5 mm. long with 16 segments, resembling P_6; P_8 is slightly stouter in the basal portion than the preceding pinnules; on the succeeding pinnules the relative length of the stout basal portion increases so that the genital pinnules are broader and more sharply triangular than the preceding with shorter segments of which only the outermost have spines at their prismatic angles; the distal pinnules are about 17 mm. long, becoming gradually shorter toward the arm tips.

A specimen with 22 arms about 95 mm. long is rather larger than the others, in all of which the arms are broken off at the base. P_1 is 9.5 mm. long with 14 segments; P_2 is 11 mm. long with 14 segments; P_3 is 15.5 mm. long with 17 segments; P_4 is 17 mm. long with 15 segments; P_6 is 18.5 mm. long with 17 segments; P_7 is 18.5 mm. long with 16 segments; P_8 is 19 mm. long with 19 segments; P_9 is 19.5 mm. long with 18 segments; P_{10} is 19 mm. long with 18 segments.

2. *Pterometra pulcherrima* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 400 (*Ptilometra pulcherrima*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 547 (*Asterometra pulcherrima*).
—— Crinoids of the Indian Ocean, 1912, p. 193 (*Asterometra pulcherrima*).

Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 1 Ex.

This specimen agrees well with the type. There are twenty arms 90 mm. to 95 mm. long. The cirri are XX, 92—96, 78 mm. long. The colour in alcohol is white.

2nd Subfamily Thalassometrinae A. H. Clark.

Key to the Genera of the Subfamily Thalassometrinae.

a^1 Ten arms

b^1 genital pinnules with the third-fifth segments greatly expanded, forming a broad roof over the gonads; calyx and arm bases smooth; 30—40 cirrus segments (Straits of Florida and southeastward to Grenada) . . . . . **Horaeometra**

b^2 no expansion of the segments of the genital pinnules

c^1 ossicles of the division series and of the arm bases with numerous prominent spines which may be more or less confined to the borders of the ossicles and to the median line, or generally distributed over the dorsal surface; ossicles of the division series and first two brachials sometimes with a slight carinate process bearing spines along the crest; arms beyond the second brachial well rounded dorsally, never carinate; P_1 very stout, much stouter than the succeeding pinnules, though with a delicate tip; 10—13 (usually 10) arms; division series usually 2, sometimes 4 (3 + 4) (Morocco and Madeira southward to Ascension and the Crozet Islands; east Africa to the Kermadec, Galápagos, Hawaiian and western Aleutian Islands, and southern Japan). . . . . **Thalassometra**

c^2 ossicles of the division series and of the arm bases smooth, without spines on the dorsal surface, though they may have irregular processes on their lateral borders, and isolated spines on their proximal and distal borders; P_1, though larger and stouter than those succeeding, is not especially enlarged

d^1 cirri long, with more than 40 segments

e^1 division series and arms very narrow and strongly compressed laterally; a prominent narrow, usually low, keel runs the entire length of the division series and arms; the lateral borders of the ossicles of the division series and of the arm bases bear coarse irregular spines; the proximal cirrus segments have a

distinct keel in the middorsal line and usually a small spine in the centre of the distal dorsal border; 10—12 arms; IIBr series, if present, 2 (Queensland and Timor to the Philippine Islands; southern Japan) . . . . . **Daidalometra**

e^2 arms not narrow nor strongly compressed laterally, and with no carination; sides and proximal and distal edges of the ossicles of the division series nearly or quite smooth

f^1 division series and arms broad, well rounded dorsally; habitus robust (Kermadec Islands to the Moluccas and the Philippines) . . . . . **Aglaometra**

f^2 division series and arm bases narrower, subcarinate; general habitus slender (Laccadive Islands to the Lesser Sunda Islands, Fiji, the Kermadec Islands and New South Wales) . . . . . **Stiremetra**

d^2 cirri short and stout, with less than 30 segments; division series and arm bases narrow, well rounded dorsally, appearing narrow and only slightly flattened against their neighbours; 10—20 arms; division series all 2 (Kei Islands to southern Japan and the Hawaiian Islands). . . . . **Parametra**

a^2 More than 10 arms

b^1 dorsal surface of the ossicles of the division series and of the arm bases with numerous prominent spines which may be more or less confined to the borders of the ossicles and to the median line, or generally distributed over the dorsal surface

c^1 more than 15 arms; division series strongly rounded dorsally, appearing relatively narrow

d^1 IIBr series all, or mostly, 4 (3 + 4); 15—28 arms; a more or less prominent median keel on one or both of the elements of each division series and of the first brachial pair; no overlapping spines on the brachials the distal borders of which are evenly rounded and very spinous (Moluccas to the Philippine and Hawaiian Islands) . . . . . **Oceanometra**

d^2 all the division series 2; 30 arms, a single IIIBr series being developed on the inner side of each IIBr series; no trace of a median keel on the elements of the division series or of the first brachial pair; each brachial beyond the fifth or sixth bears a long, broad, thin, sharp pointed curved spine of which the base entirely spans the ossicle longitudinally and the tip, directed nearly parallel to the axis of the arm, extends for some distance over the succeeding brachial; on succeeding brachials these spines alternate on either side of the median line; toward the end of the arm they

decrease in height and resolve themselves into a sharp carinate process crowned with spinules; P_1, though longer and stouter than the following, is slender and evenly tapering, composed of segments which beyond the second are much longer than broad, more or less constricted centrally, with produced and spinous distal edges (Yucatan to Grenada, West Indies) . . . . . **Stylometra**

c^2 less than 15 (10—13, usually 10) arms; division series usually 2, sometimes 4 (3 + 4); P_1 very stout, much stouter than the succeeding pinnules, though with a delicate tip (Morocco and Madeira southward to Ascension and the Crozet Islands; east Africa to the Kermadec, Galápagos, Hawaiian and western Aleutian Islands, and southern Japan) . . . **Thalassometra**

b^2 ossicles of the division series and of the arm bases smooth, without spines on the dorsal surface, though they may have irregular processes on their lateral borders; P_1, though larger and stouter than those succeeding, is not especially enlarged

c^1 not more than 15 arms

d^1 cirri with more than 50 segments, very long and very slender; arms slender, very narrow, strongly compressed laterally; a prominent narrow median keel on the ossicles of the division series, which is continued the entire length of the arms; 10—12 arms; division series 2; proximal cirrus segments with a distinct keel in the mid-dorsal line, and usually with a small spine in the middle of the distal dorsal edge (Queensland and Timor to the Philippine Islands; southern Japan) . . . . . **Daidalometra**

d^2 cirri with less than 35 segments

e^1 cirri with 30—34 segments, of moderate length and moderately slender; ossicles of the division series broad, very slightly convex dorsally but with a prominent sharp median carinate process, everywhere in close lateral apposition; lateral portion of the distal borders of the IBr_1, $IIBr_1$ and the first brachial produced, forming rounded thin anterior processes which imbricate over the bases of the succeeding ossicles; brachials with a very faint and obscure median carination; 13—15 arms; division series 2 (southwestern Japan) . . . . . **Lissometra**

e^2 cirri with at most 27 (usually between 20 and 25) segments, short and stout; division series and arm bases well rounded dorsally, appearing narrow and only slightly flattened against their neighbours; 10—20 arms; division series 2 (Kei Islands to southern Japan and the Hawaiian Islands) . **Parametra**

c^2 more than 15 (usually 20) arms

d[1] cirri with at most 27 (usually between 20 and 25) segments, short and stout; division series and arm bases well rounded dorsally, appearing narrow and only slightly flattened against their neighbours; 10—20 arms; division series 2 (Kei Islands to southern Japan and the Hawaiian Islands) . . . . . **Parametra**

d[2] cirri with more than 40 segments, long, slender or stout

e[1] division series and arms very narrow, slender, strongly compressed laterally, sharply carinate throughout; cirri very long and very slender; 20 arms; division series 2 (Kei Islands to the Philippines, and northward to southern Japan) . **Stenometra**

e[2] division series and arms usually stout, the latter well rounded dorsally, at least in the earlier portion; the ossicles of the division series and the first two brachials are usually smooth dorsally, but may have a very slight median keel, which is not continued on to the arm bases

f[1] IIBr series 4 (3 + 4); division series and arm bases very strongly rounded dorsally, the dorsal surface entirely free of spinules or carinate processes (Bay of Biscay to the Canaries and Ascension Island; southern and eastern Africa to the Moluccas and the Philippines) . . . . . **Crotalometra**

f[2] all division series 2; ossicles of the division series usually with a flattened dorsal surface, perfectly smooth, with swollen borders, or with a lateral, proximal and distal border of thickly set fine spinelets (Caribbean Sea; southwestern Indian Ocean to the Moluccas, the Philippines, the Hawaiian Islands and southern Japan) . . **Cosmiometra**

Crotalometra A. H. Clark.

Key to the Species of the Genus Crotalometra.

a[1] Centrodorsal thick discoidal, with the large stout cirri arranged in an irregular partially double row about the periphery

b[1] about 30 cirrus segments of which the longest are about twice as long as broad; brachials from the first onward with the distal edges turned outward and produced, and the ossicles of the division series with the distal edges prominent, giving the animal a rugged appearance (Bay of Biscay to the Canary Islands; 882—1480 Metres). . . . . *flava*

b[2] 40—50 cirrus segments, the longest only slightly longer than broad; division series and arm bases nearly or quite smooth (Bay of Biscay to Ascension Island; 755—1480 Metres) . . . . . *porrecta*

a^2 Centrodorsal truncated conical, the cirri arranged in ten columns, two in each radial area; 60—70 cirrus segments

b^1 brachials after the proximal third of the arm with the central portion of the distal edge produced into long overlapping spines which are more or less flattened dorsoventrally and rounded or truncated at the tip; 12—16 arms (Laccadive Islands; 1265 Metres) . . . . . *sentifera*

b^2 brachials with the distal borders not provided with long overlapping spines

c^1 70 or more cirrus segments (Malay Archipelago and the Philippine Islands; 54—414 Metres) . . . . . *rustica*

c^2 60—63 cirrus segments

d^1 radials concealed by a narrow rim about the proximal margin of the IBr_1; ends of the basal rays very prominent as high dorsoventrally elongate tubercles which are usually rather longer than the dorsoventral length of a cirrus socket; sides of the IBr_1 in the interradial angles cut away to accomodate the ends of the basal rays; 17—18 arms (Moluccas; 1595 Metres). . . . . *marginalis*

d^2 no produced proximal border on the IBr_1 concealing the radials, which form a closed ring about the calyx separating the ends of the basal rays from the IBr_1 (South Africa; 540—810 Metres). . . . *magnicirra*

1. *Crotalometra flava* (Koehler).

KOEHLER. Revue biol. du nord de la France, vol. 7, 1895, p. 475 (*Antedon flava*).
—— et VANEY. Bull. du Mus. d'hist. nat., Paris, 1910, N° 1, p. 31 (*Antedon [Crotalometra] flava*).
A. H. CLARK. Proc. U. S. National Museum, vol. 40, 1911, p. 37 (*Crotalometra flava*).

2. *Crotalometra porrecta* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 250, pl. 52, figs. 3—5 (*Antedon porrecta*).
KOEHLER et VANEY. Bull. du Mus. d'hist. nat., Paris, 1910, N° 1, p. 32 (*Antedon [Crotalometra] porrecta*).
A. H. CLARK. Proc. U. S. National Museum, vol. 40, 1911, p. 37 (*Crotalometra porrecta*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 46 (*Crotalometra porrecta*).

3. *Crotalometra sentifera* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 147 (*Crotalometra sentifera*).
—— Crinoids of the Indian Ocean, 1912, p. 201, fig. 37, p. 202 (*Thalassometra sentifera*).

4. *Crotalometra rustica* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 80 (*Crotalometra rustica*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 550 (*Crotalometra infelix*).
—— Crinoids of the Indian Ocean, 1912, p. 198, fig. 36, p. 199 (*Thalassometra rustica*); p. 203 (*Thalassometra infelix*).

5. *Crotalometra marginalis* (A. H. Clark).

A. H. CLARK. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 424 (*Thalassometra marginalis*).

Stat. 226. Mid-channel between the Lucipara and Schildpad Islands. 1595 Metres. 2 Ex.

One of the specimens has 17 arms about 95 mm. long; two of the IIBr series are 2, and five are 4 (3 + 4); the cirri are 50 mm. long with 60 segments; the other, of the same size, has 18 arms with all of the IIBr series 4 (3 + 4).

The individuals have about half the arm and cirrus length of *C. rustica*, though apparently they represent a species very closely related to it.

The centrodorsal is low, rounded conical; the cirrus sockets are arranged in columns of two each, the two columns in each radial area being in close contact with those of adjacent areas exteriorly but separated interiorly by a bare triangular area about half as wide as a cirrus socket which comes to a point just beyond the last functional socket and is continued thence as a narrow line to the dorsal pole.

The proximal edge of the IBr_1 are produced into a narrow rim which projects over the radials, entirely concealing them; the ends of the basal rays are very prominent as high dorsoventrally elongate tubercles which are usually rather longer than the dorsoventral length of a cirrus socket; in the interradial angles the IBr_1 are cut away to accomodate the basal rays, whereas in *C. rustica* they are separated from the basal rays by the radials which form a continuous band all around the calyx. In one specimen a small portion of the lateral edge of the radials is visible as two elongate tubercles meeting in a triangle over the ends of the basal rays.

6. *Crotalometra magnicirra* (Bell).

BELL. Marine Investigations in South Africa, vol. 3, 1905, p. 141 (*Antedon magnicirra*); p. 142 (*Antedon magnicirrus*); pl. 4 (*Antedon magnicrinus*).

A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 45 (*Crotalometra magnicirra*).

Oceanometra A. H. Clark.

Key to the Species of the Genus Oceanometra.

a¹ Not over 60 cirrus segments; keels on the division series and first two brachials confined to the distal element of each pair (axillaries and $IIBr_2$ when not axillary, and second brachials), being entirely absent from the proximal elements; large and very robust, the cirri exceptionally stout; 17 arms 180 mm. long; cirri XXX, 55—60, 60 mm. to 80 mm. long (Hawaiian Islands; 774—858 Metres) . . . . . *gigantea*

a² 62—79 cirrus segments; all the elements of the division series and both the brachials of the first pair carry keels

b¹ 28 arms; stout and robust, with large stout cirri which are more than half the length of the arms (Lesser Sunda Islands; 204 Metres). . . . *magna*

b² 15—22 (usually 20) arms; slender, with slender cirri which are considerably less than half the length of the arms (Malay Archipelago and the Philippine Islands; 54—502 Metres). . . . . *annandalei*

1. *Oceanometra gigantea* (A. H. Clark).

A. H. Clark. Proc. U.S. National Museum, vol. 34, 1908, p. 222 (*Thalassometra gigantea*).

2. *Oceanometra magna* (A. H. Clark).

A. H. Clark. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 425 (*Thalassometra magna*).

Stat. 251. 5°28′.4 S., 132°0′.2 E. Arafura Sea. 204 Metres. 1 Ex.

The centrodorsal is conical, the sides slightly swollen, the tip truncated, 5.5 mm. broad at the base and 5 mm. high; the dorsal pole is about 1.5 mm. in diameter, approximately flat, covered with fine papillae; the cirrus sockets are arranged in ten columns, two to each radial area, usually four (rarely three or five) to a column; on the outer side of each radial area the columns are closely crowded against the columns of adjacent radial areas, but in the midradial line they are separated by a bare, slightly concave, area which proximally is nearly or quite as broad as the adjacent cirrus sockets, but which rapidly becomes narrow so that the outermost one or two sockets in each area are in contact in the midradial line. Very deep, though very narrow, subradial clefts separate the centrodorsal from the radials.

The cirri are XXX—XL, 66—74, 70 mm. to 85 mm. long; the shorter cirri toward the apex of the centrodorsal are 60 mm. long with 59 segments. The first cirrus segment is very short, and the following slowly increase in length to the fifth, which is slightly more than twice as broad as long, and the seventh, which is about as long as broad; the eighth is a transition segment, nearly or quite twice as long as the distal diameter; the ninth is similar; the following slowly decrease in length to the twenty-second or twenty-third, which is about as long as its proximal diameter, and still further to those in the distal fifth of the cirri, which are twice as broad as long, and the terminal, which are still shorter. On the fifteenth or sixteenth the distal dorsal edge begins to project in the median line; on the succeeding segments this projection slowly increases in extent and, the middorsal line of the segments rising into a sharp keel, transforms on the short distal segments into the very high carinate dorsal spines characteristic of the genus. The last six or seven segments gradually decrease in diameter so that the penultimate segment is very small. The distal edges of the earlier segments, especially dorsally, are very finely spinous so that the cirri are rough to the touch.

The ends of the basal rays are visible as dorsoventrally elongate tubercles bridging over the subradial clefts.

The radials are very short, with a slight rounded median prominence and with a few small teeth on the distal margin. The IBr_1 are short, between four and five times as broad as

long, broadly V-shaped in direct lateral view, with the proximal and distal edges parallel; the proximal and distal edges are slightly everted; the former bears a few short irregularly placed spines on the margin; the latter bears on either side of the median line about eight regular teeth which begin one third of the distance from the median line and gradually increase in length to the lateral corners; this row of teeth is continued inward toward the median line by small spines of decreasing size; the lateral edges are slightly produced and smooth; the antero-lateral angles bear a few prominent blunted spines; there is a prominent and sharp, though not especially high, median keel. The IBr_2 (axillaries) are broadly rhombic, with the lateral angles truncated, about twice as broad as long; the lateral edges, which are not quite so long as those of the IBr_1, are produced and irregularly and coarsely spinous; the distal edges and the outer portion of the proximal edges are slightly everted and finely spinous; a prominent keel, resembling that on the IBr_1, runs nearly their whole length. IIBr 4 (3 + 4) (nine present), resembling the IBr series and, like them, prominently carinate; the lateral borders of the elements of the IIBr series are produced and irregularly denticulate or spinous. IIIBr 4 (3 + 4) (nine present), resembling the IIBr series; the ossicles of the division series and of the arm bases have produced and irregularly denticulate lateral borders as far as the base of P_2 externally, and as far as the fifth or sixth brachial internally.

The arms are 28 in number, about 120 mm. long, resembling those of *O. gigantea*; the first two brachials are carinate; the following have slightly everted and finely spinous distal edges, and the dorsal (but not the dorsolateral) surface covered with very numerous short fine spines; as the brachials become triangular the proximal edges gradually lose their eversion, while that of the distal edges becomes recumbent and more prominently spinous, and the spinosity of the dorsal surface gradually becomes arranged in definite lines, becoming a series of sharp serrate longitudinal striations.

The disk, especially along the ambulacral grooves, is thickly beset with small rounded plates which become produced along the ambulacra; side and covering plates are well developed.

P_D is from 14 mm. to 16 mm. long, composed of 28—30 segments, comparatively slender as in the two other species of the genus, and tapering very gradually to a delicate tip; all of the component segments are broader than long; the distal outer and distal inner margins of the segments are sharply and very prominently carinate, this carination being very spinous, and on the proximal portion of the inner margin coarsely denticulate; a shallow concave through runs between these ridges; the proximal segments are more or less spinous on the proximal (dorsal) surface. P_P is like P_D, but not nearly so long nor so large. P_1 is 14 mm. long with 26 segments, similar to P_D but more slender with the component segments somewhat longer and their produced borders more spinous, and the distal edges of the outer produced and spinous. P_2 is 8 mm. long with 17 segments, much more slender than P_1 with longer segments distally which have more produced and spinous distal edges. The following pinnules become progressively more slender with progressively longer segments which have coarsely spinous distal ends. P_3 is 7.5 mm. long; P_4 is 7 mm. long; P_5 is 6.5 mm. long; P_6 is 6 mm. long. The distal pinnules are 13 mm. long, composed of 18—20 segments; the crest of the prismatic ridge is finely spinous.

In general appearance this species is intermediate between *gigantea* and *annandalei*, though rather more like the former.

It differs from *gigantea* in having keels on the proximal elements of the pairs of ossicles forming the division series, and the first pair of brachials as well as on the distal; in the more numerously jointed, more slender, and relatively longer cirri; in having more numerous arms (28 instead of 17); in the absence of interradial ridges separating the columns of cirrus sockets on the centrodorsal; in the much less spinous borders of the division series and lower brachials; and in having the IIIBr series 4 (3 + 4) instead of 2.

It differs from *annandalei* in being larger and more robust; in having no spines on the dorsal surface of the proximal ossicles; in having the ossicles of the division series with irregularly dentate produced lateral borders instead of smooth; in the much less spinous dorsal surface of the earlier brachials; and in the larger and stouter cirri.

3. *Oceanometra annandalei* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 406 (*Crotalometra eupedata*; eleven armed example).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 642 (*Crotalometra annandalei*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 551 (*Thalassometra annandalei*).
—— Crinoids of the Indian Ocean, 1912, p. 195, fig. 35, p. 196 (*Thalassometra annandalei*).

Cosmiometra A. H. Clark.

Key to the Species of the Genus Cosmiometra.

a¹ 28 arms, a IIIBr series being developed on the outer side of each IIBr series, 100 mm. long; cirri with about 40 segments, 25 mm. to 30 mm. long; ossicles of the division series with everted, though perfectly smooth, edges, and a narrow and low, but prominent median carination which, becoming zigzag on the triangular brachials beyond the arm bases, is continued to the arm tips (Hawaiian Islands; 574 Metres) . . . . . *delicata*

a² 20 arms; no IIIBr series developed

b¹ elements of the division series and first two brachials with numerous fine spines, either in a broad band along the lateral borders of the dorsal surface, or in a row along the entire everted border of each ossicle

c¹ radials, lateral third of the IBr series, and lateral fourth of the IIBr series covered with a band of densely packed fine spinules; edges of the ossicles of the division series and brachials with a row of very fine spinules, but not everted; no carination on the division series or arms; arms 100 mm. to 130 mm. in length; cirri with 49—61 segments (Kei Islands to northern Mindanao, Philippines; 304—612 Metres) . . . . . *philippinensis*

c² radials concealed; lateral borders and proximal and distal edges of the ossicles of the division series and first two brachials everted and

armed with spinules which become very numerous on the lateral portion of the dorsal surface of the IBr_1; a broad and low, almost obsolete, carination on the arms; arms 125 mm. long; cirri with 40—55 segments, 40 mm. long (southern Japan; 664—729 Metres) . . *aster*

b^2 elements of the division series and first two brachials perfectly smooth, without spines

c^1 cirri with at least 50 segments

d^1 elements of the division series and first two brachials with narrowly prominent borders and low narrow median keels; arms 120 mm. long; cirri with 55—60 segments (Hawaiian Islands; 245 Metres) *crassicirra*

d^2 elements of the division series and first two brachials without modified borders, and with no trace of a median keel

e^1 about 50 cirrus segments (St. Vincent, West Indies; 158 Metres) . . . . . *koehleri*

e^2 about 70 cirrus segments (southern Japan; "deep water") *conifera*

c^2 cirri with not more than 45 segments; division series strongly, but roundedly, carinate

d^1 cirri longer and more slender, 30 mm. long with 29—31 segments; carination of the division series broader; lower brachials with a broad median keel (Saya de Malha; 243 Metres) . . . . *gardineri*

c^2 cirri shorter and stouter, 27 mm. long with 40—41 segments; carination of the division series narrower; lower brachials with a faintly indicated crest (Sahul Bank; no depth recorded) . *woodmasoni*

1. *Cosmiometra koehleri* A. H. Clark.

HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 366, pl. 3, figs 2, 4; pl. 14, figs. 5, 10 (*Antedon duplex*, part).

2. *Cosmiometra conifera* (Hartlaub).

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 76, pl. 4, fig. 46; pl. 5, figs. 51, 56 (*Antedon conifera*).

3. *Cosmiometra delicata* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 225 (*Thalassometra delicata*).

4. *Cosmiometra crassicirra* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 225 (*Thalassometra crassicirra*).

5. *Cosmiometra gardineri* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 40, 1911, p. 31 (*Cosmiometra gardineri*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 43 (*Cosmiometra gardineri*).

6. *Cosmiometra woodmasoni* (Bell).

BELL. Journ. Linn. Soc. (Zoöl.), vol. 24, 1893, p. 340, pl. 23 (*Antedon wood-masoni*).
A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 214 (*Cosmiometra woodmasoni*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 44 (*Cosmiometra woodmasoni*).

7. *Cosmiometra aster* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 145 (*Antedon aster*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 310 (*Thalassometra aster*); p. 311 (*Thalassometra komachi*).

8. *Cosmiometra philippinensis* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 548 (*Cosmiometra philippinensis*).
—— Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 427 (*Cosmiometra helene*).

Stat. 95. 5°43′.5 N., 119°40′ E. Sulu Archipelago. 522 Metres. 1 Ex.
Stat. 253. 5°48′.2 S., 132°13′ E. Arafura Sea. 304 Metres. 1 Ex.
Stat. 254. 5°40′ S., 132°26′ E. Arafura Sea. 310 Metres. 1 Ex.

From. Stat. 95 there is one young specimen with 13 arms 45 mm. long and the longest cirrus 21 mm. long with 40 segments.

The example from Stat. 253, which I at first considered as representing a new species, *helene*, may be described as follows:

The centrodorsal is moderate in size, truncated conical, about 4.5 mm. broad at the base and about 2.5 mm. high interradially. The cirrus sockets are arranged in ten columns of two or three each; interradially the columns are in close apposition, but in the midradial line they are separated by a wedge-shaped area, at first about as broad as a cirrus socket, but with the converging sides coming together just beyond the last cirrus sockets, which is entirely covered with fine, more or less sharp, granulations. The dorsal pole is irregular, 2 mm. in diameter.

The cirri are moderately stout, 37 mm. to 47 mm. long, with 52—61 segments of which the first four are very short, the fifth sligthly over twice as broad as long, the sixth, a transition segment, half again as long as broad, and the seventh slightly longer than the sixth; the following gradually decrease in length, becoming about as long as broad on the thirteenth, twice as broad as long on the twentieth, and shorter distally; dorsal processes begin on the thirteenth, gradually increasing in height; the dorsal spines are high, strongly carinate, V-shaped in end view, the two distal edges finely serrate; at the tip of the cirrus they become narrower and smooth.

The radials are entirely concealed; the IBr_1 are short, about four times as broad as the lateral length, slightly convex proximally, distally incised by a rounded process from the axillary so that the median length is only about two thirds of the lateral; the proximal border is armed with very numerous fine short spines; the distal border is similarly modified, but the spines become more or less obsolete in the median third; the lateral borders are similarly modified, but the spines extend further imward over the dorsal surface of the ossicle and are more

developed; the lateral thirds of the dorsal surface of the IBr_1 are rather thickly covered with fine short spines. The axillaries are rhombic, somewhat over twice as broad as long, with the lateral angles truncate; the lateral sides (formed by the truncation of the lateral angles) are only about one third as long as the sides of the IBr_1; the proximal borders are modified like the corresponding borders of the IBr_1; the distal borders are very finely spinous; the lateral fourths of the dorsal surface are covered rather thickly with fine short spines like the lateral thirds of the IBr_1; the synarthrial tubercles are low, and only slightly marked; the division series are only slightly convex dorsally, sharply flattened laterally, and in very close apposition.

The IIBr series are 2, the component ossicles resembling those of the IBr series, but the proximal and distal borders are more finely spinous, and the spinous modification of the lateral portion of the dorsal surface is relatively narrower exteriorly, and very narrow interiorly.

The twenty arms are from 95 mm. to 100 mm. long; the spinous modification of the lateral portion of the dorsal surface of the ossicles of the division series runs up in a very narrow and progressively narrowing band both internally and externally as far as the third or fourth brachial; the proximal oblong brachials have very slightly everted edges; as the brachials become triangular serrate longitudinal striations appear, first only in the median line, but soon over the entire dorsal surface of the ossicles, which have slightly overlapping and spinous distal edges.

The specimen from Stat. 254 is similar; there are 20 arms about 95 mm. long; the cirri are 35 mm. to 40 mm. long with 56—60 segments.

Stylometra A. H. Clark.

The only species in this genus is the following:

1. *Stylometra spinifera* (P. H. Carpenter).

P. H. CARPENTER. Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, p. 158 (*Antedon spinifera*.
VON GRAFF. Bull. Mus. Comp. Zoöl., vol. 11, 1883, N° 7, p. 129 (*Antedon spinifera*).
—— "Challenger" Reports. Myzostoma, 1884, pp. 14, 15, 19 (*Antedon spinifera*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 379 (*Antedon spinifera*).
A. H. CLARK. Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 256 (*Stylometra spinifera*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p 43 (*Stylometra spinifera*).

Stenometra A. H. Clark.

Key to the Species of the Genus Stenometra.

a[1] Cirri with 80—90 segments, about one quarter of the arm length; crest of the carination on the ossicles of the IBr series and the first two brachials nearly or quite straight, without pronounced denticulations (Kei Islands; 252 Metres) . . . . . *quinquecostata*

a[2] Cirri with about 70 segments

b[1] longest cirrus segments only slightly longer than broad; profile of the median keel on the elements of the IBr series and first two brachials irregular and serrate (southern Japan; 91—306 Metres) . . . . *diadema*

b^2 longest cirrus segments twice as long as broad, or slightly longer; profile of the median keel on the elements of the IBr series and first two brachials even, or nearly so (Philippine Islands; 210 Metres) . . *cristata*

1. *Stenometra quinquecostata* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 262, pl. 3, figs. 6, *a—d*; pl. 38, figs. 1—3 (*Antedon quinquecostata*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N⁰ 15, p. 44 (*Stenometra quinquecostata*).

2. *Stenometra diadema* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 144 (*Antedon diadema*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 310 (*Thalassometra quinquecostata*).
—— Vid. Med. fra den naturhist. Forening i København, 1909, p. 186 (*Stenometra dorsata*).

3. *Stenometra cristata* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 553 (*Stenometra cristata*).

Daidalometra A. H. Clark.

Key to the Species of the Genus Daidalometra.

a^1 65—75 cirrus segments; cirri more than two thirds as long as the arms; carination of the ossicles of the division series and of the proximal brachials low and more or less blunted along the crest (southwestern Japan; 192—250 Metres) . . . . . *hana*

a^2 51—65 cirrus segments; cirri less than half as long as the arms; carination of the ossicles of the IBr series and of the proximal brachials higher and sharper (Port Denison, Queensland, to Timor and the southern Philppine Islands; 0—118 Metres) . . . . . *arachnoides*

1. *Daidalometra hana* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 137 (*Antedon hana*).

2. *Daidalometra arachnoides* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, p. 402 (*Stenometra arachnoides*).
—— Zool. Anzeiger, vol. 39, 1912, N⁰ 11/12, p. 428 (*Stenometra acuta*).

Stat. 166. 2° 28′.5 S., 131° 3′.3 E. Ceram Sea. 118 Metres. 4 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. Timor Sea. 73 Metres. 6 Ex.

Of the specimens from Stat. 166 one has 10 arms and cirri with 54 segments; another has 13 arms about 60 mm. long and cirri with 49—54 segments, 20 mm. to 25 mm. long; the other two have 16 and 18 arms respectively.

The largest example from Stat 294 has 12 arms about 60 mm. long; the cirri are XII, 51—58, 25 mm. long; the others are all small, with 10 arms.

Parametra A. H. Clark.

Key to the Species of the Genus Parametra.

a^1 Arms evenly rounded dorsally, the brachials, including the distal, entirely without a median elevation or carination, and with only very slightly produced edges; elements of the division series very strongly convex dorsally, entirely without swollen or everted borders, their centres occupied by a very broad, low and obscure median swelling (Hawaiian Islands; 345—634 Metres) . . . . *fisheri*

a^2 Brachials always with the mid-dorsal portion abruptly raised, forming a more or less evident carinate process; borders of the ossicles of the division series, which are only slightly convex dorsally, more or less raised or everted; a more or less developed notch is present between the outer portion of te proximal borders of the axillaries and second brachials and the preceding ossibles, these notches, when the arms are in apposition, forming pores through which water reaches the sides of the disk

b^1 the ossicles of the division series and the earlier brachials have strongly everted edges; the distal, or both, elements of the division series and the first brachial pair have a rounded and inconspicuous carinate process; the cirri have about 20 segments (Kei and Lesser Sunda Islands; 216—252 Metres) . . *compressa*

b^2 the ossicles of the division series and the earlier brachials have moderately everted distal edges; the ossicles of the division series and the first two brachials are either smooth dorsally, or bear rounded and inconspicious carinate processes; more than 20 cirrus segments

c^1 from 10 to 18 (but very rarely more than 15) arms; ossicles of the division series usually entirely without median carination; sides of the division series usually quite smooth, buth the lateral borders of the ossicles of the IBr series may be crenulate, or more or less tubercular (Hong Kong and Formosa to southern Japan; 128—306 Metres) . . . . . *orion*

c^2 from 16 to 20 (usually from 17 to 20) arms; ossicles of the division series usually with a low and narrow median carination; sides of the division series usually with a more or less developed tubercular ornamentation (Philippine Islands; 148—502 Metres). . . . . *granulata*

1. *Parametra fisheri* (A. H. Clark).

A. H. Clark. Proc. U.S. National Museum, vol. 34, 1908, p. 223 (*Thalassometra fisheri*).

2. *Parametra compressa* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 222, pl. 41, (*Antedon compressa*, part).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 45 (*Parametra compressa*).

Stat. 302. 10° 27'.9 S., 123° 28'.7 E. Timor Sea. 216 Metres. 1 Ex.

The centrodorsal is discoidal, with a bare flat polar area 3.5 mm. in diameter.

The cirri are XIV, 18—20, 23 mm. long; the first segment is very short, the following gradually increasing in length to the fourth, which is slightly broader than long, and the fifth-seventh, which are as long as, or very slightly longer than, broad; the eighth, a transition segment, is about half again as long as the median diameter; the ninth is about as long as the median diameter; the following gradually decrease in length so that the last three or four before the penultimate are about twice as broad as long; the distal dorsal edge of the eighth is thickened; on the succeeding this soon becomes a thick rounded dorsal spine of the type characteristic of the genus.

The ends of the basal rays are visible as small but prominent rounded tubercles in the angles of the calyx. The radials are concealed.

The IBr_1 are very short, about twice as long on the lateral border as in the median line, in lateral apposition for the basal two thirds but in the distal third diverging in nearly a straight line, extending well up in the angles of the calyx; they bear a low blunt median carination. The IBr_2 (axillaries) are rhombic, twice as broad as long, the lateral angles in contact with those of their neighbors; the cutting away of the distal angles of the IBr_1 forms large and conspicuous water pores just beneath the apposed angles of the axillaries; in the median line of the axillaries there is a low blunt median carination; from the lateral angles a horizontal ridge runs inward for one third to one half of the distance to the median line, sometimes in the middle of the angle, sometimes toward the proximal side, where it branches, one branch curving downward and becoming a produced proximal border which runs to the median carination, the other branch running as a thickened rim along the distal faces of the axillary, or as a ridge just within the distal edges, sometimes meeting just proximal to the distal apex, but usually forming a broad curve beyond which is the apex. The IIBr series are 2; the proximal and distal edges of the elements of the IIBr series are moderately thickened and everted; there is a slight rounded median carination; the axillaries have thickened distal edges and produced proximal edges, the latter running in broad curve in the central part of the segment, in the lateral third or fourth running nearly or quite straight to the lateral angle.

The edges of the first two brachials are modified like those of the elements of the IIBr series; there is a trace of a median carination.

P_1 is 10 mm. to 12 mm. long with 17—21 segments which become about as long as broad on the sixth, and nearly twice as long as broad terminally; the pinnule is evenly tapering, rather strongly prismatic, and but little enlarged; the second-fifth segments are sharp distally, though not distinctly carinate; the outer segments have the distal angles rather prominent, though not produced. P_2 is 6.5 mm. long with 12 segments, shorter, more slender, and slightly less tapering than P_1; the pinnule is strongly and sharply prismatic, the profile of the prismatic angle on the outer segments being sligthly convex; the distal segments have slightly prominent distal angles. P_3 is 6 mm. long with 12 segments, similar to P_2 but tapering slightly more rapidly distally. The following pinnules resemble P_3. The distal pinnule are slender 9 mm. long with 17 segments.

3. *Parametra granulata* A. H. Clark.

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 212 (*Antedon compressa*, part; specimen from Stat. 201).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 227 (*Thalassometra compressa*).
—— Proc. U. S. National Museum, vol. 36, 1909, p. 406 (*Parametra compressa*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 554 (*Parametra compressa*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 45 (*Parametra granulata*).

Stat. 105. 6° 8′ N., 121° 19′ E. Sulu Sea. 275 Metres. 1 Ex.

This small specimen has 10 arms about 35 mm. long; this cirri have 15 segments of which the fourth is a transition segment.

4. *Parametra orion* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 143 (*Antedon orion*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 310 (*Thalassometra orion*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 554 (*Parametra orion*).

Lissometra A. H. Clark.

The only species in this genus is the following:

1. *Lissometra alboflava* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 145 (*Antedon alboflava*).

Horaeometra A. H. Clark.

The only species in this genus is the following:

1. *Horaeometra duplex* (P. H. Carpenter).

VON GRAFF. Bull. Mus. Comp. Zoöl., vol. 11, 1883, N° 7, p. 133 (*Antedon duplex*).
—— "Challenger" Reports. Myzostoma, 1884, pp. 17, 18 (*Antedon duplex*).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, pp. 207, 212 (*Antedon duplex*).
HARTLAUB. Mem. Mus. Comp. Zoöl., vol. 24, 1912, N° 4, p. 366 (part), pl. 3, figs. 6—11 (but not 2, 4, 5); pl. 14, fig. 13 (but not 5 and 10) (*Antedon duplex*).

Stiremetra A. H. Clark.

Key to the Species of the Genus Stiremetra.

a^1 Longest proximal cirrus segments only very slightly longer than broad; all the cirrus segments except the very short basal bear very prominent dorsal spines (off Port Jackson, New South Wales; 1710 Metres) . . . . . *spinicirra*

a^2 Longest proximal cirrus segments at least twice as long as broad; dorsal spines confined to the shorter distal segments

b^1 centrodorsal large and columnar, the two columns of cirrus sockets in each radial area separated interiorly by a broad V-shaped furrow as wide as the

adjacent cirrus sockets; 50—64 (usually 57—58) cirrus segments; the four to seven cirrus segments after the twenty-third have a shallow rounded notch in the dorsal carination so that they appear to bear two spines, a proximal and a distal (Laccadive Sea; 774 Metres) . . . . . *carinifera*

b^2 centrodorsal hemispherical or truncated conical, the ten columns of cirrus sockets in close lateral apposition

c^1 axillaries longer than broad, their posterior processes in lateral view almost bisecting the IBr_1 (Fiji; 2430 Metres) . . . . . *acutiradia*

c^2 axillaries markedly broader than long

d^1 40—50 cirrus segments (Kermadec Islands and Fiji; 1134—2430 Metres) . . . . . *breviradia*

d^2 62—66 cirrus segments (Moluccas; 1158 Metres) . . . . . *perplexa*

1. *Stiremetra spinicirra* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 112, pl. 11, figs. 1, 2 (*Antedon spinicirra*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 44 (*Stiremetra spinicirra*).

2. *Stiremetra carinifera* A. H. Clark.

A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 211 (*Stiremetra carinifera*).

3. *Stiremetra acutiradia* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 113, pl. 11, figs. 3, 4 (*Antedon acutiradia*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 45 (*Stiremetra acutiradia*).

4. *Stiremetra breviradia* (P. H. Carpenter).

von Graff. Bull. Mus. Comp. Zoöl., vol. 11, 1883, N° 7, p. 133 (*Antedon radiospina*).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 110, pl. 3, figs. 4, 5; pl. 11, fig. 5; pl. 19; pl. 20, figs. 1, 2 (*Antedon breviradia*); pl. 3, figs. 4, *a—c* (*Antedon radiospina*); pl. 3, fig. 5 (*Antedon eversa*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 45 (*Stiremetra breviradia*).

5. *Stiremetra perplexa* (A. H. Clark).

A. H. Clark. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 426 (*Thalassometra perplexa*).

Stat. 211. 5°40'.7 S., 120°45'.5 E. Banda Sea. 1158 Metres. 1 Ex.

The centrodorsal is small, truncated conical, the dorsal pole entirely covered with elongate tubercles or papillae; the cirrus sockets are arranged in ten closely crowded columns of two or three (usually two) each.

The cirri are XVIII, 62—66, 35 mm. to 40 mm. long; the longest cirrus segment (usually the sixth) is from two and one half to three times as long as broad; the following slowly decrease in length, in the middle of the cirri being about as long as broad, or slightly broader than long, and in the terminal fourth or fifth twice as broad as long; the longer proximal segments have a slight median constriction and slightly produced distal edges; the short distal segments have a prominent median keel which, instead of being sharp along the crest, is broadly rounded. This keel begins as a production of the distal dorsal border of the segment, but soon involves the entire dorsal surface becoming, in profile view, rounded triangular, the apex near the distal end, then evenly rounded, and in the terminal portion more or less straight along the crest.

The ends of the basal rays and the radials are concealed, the IBr_1 abutting directly upon the centrodorsal though nowhere touching it, being separated from it by narrow subradial clefts.

The IBr_1 are very narrow and band-like, from six to eight times as broad as long; they are everywhere of the same width, but while the outer surface of their lateral portions is parallel to the axis of the IBr series, their median portion is recumbent, making an angle of nearly 90° with that axis, so that in direct lateral view they are only about one third as high in the median line as laterally.

The axillaries are rhombic, with produced and broadly truncated lateral angles, half again as long as broad; the lateral edges are about as long as those of the IBr_1; the distal and proximal sides are strongly concave; a posterior process, about as high as the anterior angle but somewhat broader and more rounded, incises the IBr_1. The proximal two thirds of the median portion of the axillaries rises into a prominent, but well rounded, median elevation.

The ossicles of the IBr series are very sharply flattened against their neighbors, this flattening persisting as far as the base of P_1.

The first brachial is short, deeply incised by the second; the outer length is much greater than the inner, and more than twice the median, the distal border being strongly concave. The second brachial is irregularly quadrate, with a strong posterior process incising the first; the proximal three fourths of the median line is elevated, as in the axillary. The third brachial is oblong, very short, about five times as broad as long. All of the arms are lost beyond this point.

P_1 is 5.5 mm. long, composed of 19 segments of which the first eight are much larger, but proportionately shorter, than those succeeding; the second-seventh have thin very high carinate processes which reach a maximum on the fourth thence rapidly decreasing in heighth distally; after the eighth segments the pinnule is relatively slender, and tapers gradually to the tip. In lateral view the pinnule appears enormously swollen in the proximal three fifths (first eight segments), the swelling reaching a maximum on the fourth segment and decreasing rapidly distally; beyond the eighth segment the pinnule is slender and evenly tapering, composed of segments most of which are about as long as broad, with numerous spinules along the prismatic ridge.

Aglaometra A. H. Clark.

Key to the Species of the Genus Aglaometra.

a¹ Cirri relatively slender, less than half as long as the arms
  b¹ stouter and more rebust; the edges of the segments of the IBr series and of the earlier brachials are but very slightly if at all everted, and are armed with exceedingly fine spines, or are quite smooth; arms about 130 mm. long; cirri 60 mm. long, with 62—69 segments (Moluccas; 567 Metres) . . *vera*
  b² more slender; the edges of the segments of the IBr series and of the earlier brachials are more strongly everted, and more prominently spinous; arms 130 mm. long; cirri more slender than in the preceding, 45 mm. to the 55 mm. long, with 59—64 segments (Philippine Islands; 612—945 Metres). . *propinqua*

a² Cirri long and stout, more than half as long as the arms
  b¹ large and conspicuous water pores are present, formed by the cutting away of the distal angles of the IBr_1, and of the first brachials both interiorly and exteriorly, and the inner distal angle of the third brachial (the hypozygal of the first syzygial pair); arms 125 mm. long; cirri 60 mm. to 65 mm. long, with 63—64 segments (extreme western end of New Guinea; 798 Metres) . . . . . *sulcata*
  b² no water pores; base of animal (IBr series and arm bases) more compact
    c¹ radials large and conspicuous, more than half as high as the IBr_1, the plane of their outer surface everywhere nearly parallel with the dorsoventral axis, forming a band of equal height all around the calyx between the centrodorsal and the IBr_1; no subradial clefts; a prominent broad low rounded tubercle near the lateral borders of the axillaries; arms 150 mm. long; cirri X—XX, 66, 90 mm. long (Philippine Islands; 889 Metres) . . . . . *eupedata*
    c² radials entirely, or mostly, concealed, their central portion recumbent, making a very large angle with the dorsoventral axis, never forming a regular and uniform band between the centrodorsal and the IBr_1; conspicuous subradial clefts are present; no tubercles on the dorsal surface of the axillaries
      d¹ larger and stouter, with longer and stouter cirri; borders of the ossicles of the IBr series and the lower brachials everted and "fringed with strong spines;" arms 100 mm. long; cirri 80 mm. long with 65 segments (Meangis Islands and Moluccas; 900—1264 Metres). . . . *valida*
      d² smaller and more slender, with shorter and relatively more slender cirri; borders of the ossicles of the IBr series and the lower brachials smooth, or nearly so; arms 90 mm. long; cirri 50 mm. long with 70 segments (Kermadec Islands; 1134 Metres) . . . . . *incerta*

1. *Aglaometra eupedata* (A H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, p. 404 (*Crotalometra eupedata*).

2. *Aglaometra sulcata* (A. H. Clark).

A. H. CLARK. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 427 (*Crotalometra sulcata*).

Stat. 161. 1° 10'.5 S., 130° 9' E. Halmahera Sea. 798 Metres. 1 Ex.

The general structure of this species resembles that of *A. propinqua*, but the cirri are proportionately larger, longer and more robust, 60 mm. to 65 mm. long with 63—64 segments, and the ossicles of the IBr series and lower brachials are almost smooth, as in *A. vera*. It differs markedly from both of these in having the distal angles of the IBr_1 and the proximal angles of the axillaries, and the corresponding angles of the first two brachials and of the elements of the first syzygial pair, widely cut away, forming large and prominent rhombic water pores. The edges of the ossicles bordering these water pores are more or less everted and coarsely denticulate, or bear a few coarse spines.

3. *Aglaometra valida* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 104, pl. 15, figs. 5—8 (*Antedon valida*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 47 (*Aglaometra valida*).

Stat. 122. 1° 58'.5 N., 125° 0'.5 E. Celebes Sea. 1264—1165 Metres. 4 Ex.

The dorsal pole of the centrodorsal is more blunted than in CARPENTER's specimens, and is studded with numerous small low tubercles. The cirrus sockets are in ten columns which are interradially in apposition, but well separated in the midradial line; there is usually only a single functional socket to a column; the more distal obsolete cirrus sockets develop conical tubercles of which the axes are parallel to the dorsoventral axis of the animal; these tubercles are proportionate to the size of the cirrus socket which they occupy; thus below the functional socket in the columns there is a double row in each radial area of tubercles of diminishing size which continues to the dorsal pole, there merging with the small polar tubercles.

There are three cirri remaining contain 45 (one) and 61 (two) segments; in the first the transition segment is the ninth, in the two others the eighth. The cirri decrease slightly in diameter to the transition segment, and in lateral view increase in diameter on the short distal segments. The longest cirrus segment (the transition segment) is about twice as long as broad.

The radials are visible as short and broad, more or less irregular, tubercles between the centrodorsal and the IBr_1; one or two tubercles springing from them are visible in the angles of the calyx over the ends of the basal rays, and there may be a smaller tubercle between these and the central tubercle. The central tubercle is indicated in CARPENTER's figure, but is not clearly shown (pl. 15, fig. 5).

The ends of the basal rays are visible as small low rhombic tubercles in the angles of

the calyx, more or less obscured by the tubercles arising from the radials above them, and the cirri beneath.

The proximal border of the IBr_1 is turned outward and more or less scalloped; the median third of this border is straight and parallel with the proximal border of the centrodorsal; the lateral thirds slant outward and upward, and are slightly concave; the edge of this eversion is thickened and smooth; the lateral portions of the distal border of the IBr_1 are also everted, but not nearly so prominently as the proximal border. The IBr_1 is very slightly longer than in the "Challenger" specimens, and the distal border is not quite so much incised; this undoubtedly is due to the smaller size of these individuals.

The axillaries are not quite twice as broad as long; the proximal edge is slightly straighter than in the "Challenger" specimens, and is slightly everted; the lateral borders of the elements of the IBr series and of the first brachial and the inner borders of the first two brachials are laterally produced.

P_1 is greatly enlarged with 12 or 13 segments of which the first eight or nine are sharply flattened on the outside, the ventral border being somewhat produced; the second and third segments are strongly carinate on the inner ventral border, especially the third, but from this point the carination rapidly diminishes in extent, disappearing three or four segments further on; on the second segment this carination is parallel to the dorsoventral plane, but it gradually becomes recumbent so that on the fourth it is at right angles to this plane.

The brachials beyond the tenth are triangular, about as long as broad, with very finely spinous distal margins; the dorsal line of the arms is smooth in profile.

4. *Aglaometra vera* (A. H. Clark).

A. H. Clark. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 427 (*Crotalometra vera*).

Stat. 173. 3° 27'.0 S., 131° 0'.5 E. Ceram Sea. 567 Metres. 2 Ex.

This species is closely related to *A. propinqua*; the edges of the segments of the IBr series and of the earlier brachials are but very slightly, if at all, everted, and are armed with exceedingly fine spines or are quite smooth; the spines within the distal angle of the axillary and on the dorsal surface of the ossicles are exceedingly short and fine and difficult to detect.

The larger has 10 arms abeut 130 mm. long; the cirri are 60 mm. long and are composed of 62—69 segments of which the longest are from third to one half again as long as broad; the sixth or seventh is a transition segment.

5. *Aglaometra propinqua* (A. H. Clark).

A. H. Clark. Proc. U.S. National Museum, vol. 39, 1911, p. 549 (*Crotalometra propinqua*).

6. *Aglaometra incerta* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 106, pl. 8, figs. 4, 5 (*Antedon incerta*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61; 1913, N° 15, p. 47 (*Aglaometra incerta*).

Thalassometra A. H. Clark.

Key to the Species of the Genus Thalassometra.

a¹ Eighth and following branchials with two or three long curved spines near the distal edge, which become very prominent in the outer portions of the arms; margins of the ossicles of the IBr series and lower brachials fringed with very prominent blunt spines; radials, elements of the IBr series and first two brachials with a rounded and spinous centre raised above the lateral portions; 10 arms, 50 mm. long; cirri about XXV, 30—35 (Crozet Islands; 2926 Metres) . . . . . *bispinosa*

a² Without two or three long curved spines near the distal edge of the brachials, which have more or less overlapping and finely spinous distal edges; rarely the central portion of the laterally compressed outer brachials may be produced into a single broad, dorsoventrally flattened median overlapping spine

b¹ not more than 30 cirrus segments; cirrus sockets irregularly placed on a hemispherical centrodorsal in one irregular row of 15, and an irregular partial second row

c¹ very numerous small spines on the ossicles of the division series and arm bases; cirri about XX, 25—30; 10—12 arms about 50 mm. long; IIBr series 4 (3 + 4) (near Ascension Island, south Atlantic; 756 Metres) . . . . . *multispina*

c² dorsal surface of the ossicles of the division series and arm bases with very few or no spines

d¹ cirri XX, 25; ossicles of the IBr series and first two brachials with sharp straight edges fringed with spines, and a few spines on the dorsal surface; brachials smooth, without prominent distal ends; segments of P_1 with tufts of small spines along the distal border; 10 arms 30 mm. to 35 mm. long (Kermadec Islands; 1134 Metres). . . . . *echinata*

d² cirri X, 21; ossicles of the IBr series and first two brachials with no spines on the dorsal surface; brachials with prominent distal borders bearing very fine spines; segments of P_1 with a few very fine spinules; 10 arms probably about 35 mm. long; (Canary Islands; 1330—1349 Metres) . . . . . *omissa*

b² at least 34 (from 34 to 71) cirrus segments

c¹ cirri arranged, more or less regularly, in 15 crowded columns, three in each radial area of the centrodorsal; the radial areas of the centrodorsal are not differentiated

d¹ size very large; arms 175 mm. long; ossicles of the IBr series and brachials as far as the second syzygy fringed on the proximal and

distal borders with very prominent short blunt thorns, but without spines on the dorsal surface; cirri XV—XXII, "etwas über 60", about 40 mm. long; 10—12 arms which, with the division series, are narrow and very strongly and evenly rounded dorsally; IIBr series 2 (Galápagos Islands to Panamá; 588—1407 Metres) *agassizii*

d^2 size medium; arms 60 mm. to 95 mm. long; the ossicles of the division series and the lower brachials are not bordered with very prominent short blunt thorns

e^1 ossicles of the division series and four or five lowest brachials thickly beset with very numerous fine hair-like spines; division series and arms narrow and very strongly rounded dorsally, only slightly flattened against their neighbors; cirri XL—XLV, 50, 33 mm. long; 10—11 arms 95 mm. long; IIBr series 2 (western Bering Sea; 1883 Metres) . . . . . *villosa*

e^2 dorsal surface of the ossicles of the division series and lower brachials nearly or quite devoid of spines; division series and arm bases broad, very slightly convex dorsally, broadly and sharply flattened against their neighbors

f^1 ossicles of the IBr series and first two brachials slightly carinate and more or less fringed with small spines; a few spines on the dorsal surface of the segments, particularly on the low rounded median keel; cirri XX, 50—55, 30 mm. long; 10 arms 60 mm. long (Meangis Islands; 900 Metres) *pergracilis*

f^2 ossicles of the IBr series and first two brachials swollen in the centre, but not carinate, and without spines; cirri XII—XV, 50, 30 mm. long; 10—12 arms 60 mm. long (Portugal to the Canary Islands; 900—2165 Metres). . . . *lusitanica*

c^2 cirri arranged in 10 definite columns, two in each radial area of the centrodorsal; the radial areas of the centrodorsal are well differentiated

d^1 34—46 cirrus segments; 10 arms only

e^1 IBr_1 with the distal edge prominently everted and with about six or eight irregular dentations which have numerous fine spines at their tips; axillaries with the proximal edge like the distal edge of the IBr_1, and the distal edge with a more regular finely spinous margin; cirri XX, 34—46, 40 mm. long (Maldive Islands; 378 Metres) . . . . . *marginata*

e^2 no eversion of the borders of the ossicles of the IBr series, or of the first two brachials, which are not carinate, but are uniformly beset with very fine spines; basal portion of the animal constricted; cirri XX, about 40; arms 40 mm. long (southern Japan; 621 Metres) . . . . . *latipinna*

d^2 50—71 cirrus segments

e^1 ossicles of the IBr series and first two brachials without spines on the dorsal surface or on the proximal or distal borders, smooth dorsally, or with a few low inconspicuous tubercles, usually with slightly spinous lateral borders; third and following brachials with the dorsal surface studded with very fine short spines or sharp tubercles; cirri XX, 62—71, very slender, 50 mm. long; 10—13 very slender arms 80 mm. to 90 mm. long; IIBr 4 (3 + 4) (south of Kurrachi, India; 1377 Metres) . . *attenuata*

e^2 ossicles of the division series and the first two brachials with very prominent spines on the proximal and distal borders and, to a greater or lesser extent, on the dorsal surface

f^1 spines on the borders of the ossicles of the division series few, large and coarse, those along the proximal edges of the axillaries especially long, and slightly curved dorsalward; no spines on the dorsal surface of these segments except for a few in the centre of the IBr_1 and first brachial, and a line of short spines or tubercles down the centre of the axillaries; outer portion of the arms compressed laterally, the central portion of the distal border of each brachial abruptly produced into a broad dorsoventrally flattened overlapping spine; cirri XX, 50—55, 32 mm. long; 10—12 arms 110 mm. long; IIBr 4 (3 + 4) (Hawaiian Islands; 632 Metres) . . *hawaiiensis*

f^2 spines on the borders of the ossicles of the division series and first two brachials finer and much more numerous; the central portion of the distal edge of the outer brachials is not abruptly produced

g^1 a few coarse spines on the dorsal surface of the ossicles of the IBr series and first two brachials; these segments have the proximal and distal edges everted and abundantly armed with very fine spines, and a more coarsely spinous median carination

h^1 larger and stouter, with more numerous cirrus segments; arms 100 mm. long; cirri XV—XXV, 54—66, 30 mm. to 50 mm. long (Philippine Islands to Timor; 211—883 Metres) . . . . . *hirsuta*

h^2 smaller and more slender, with fewer cirrus segments; arms 80 mm. long; cirri XXV, 50—55, 30 mm. long (southwestern Japan; 792 Metres) . . . . . *pubescens*

g^2 numerous spines evenly distributed over the dorsal surface of the ossicles of the IBr series and the first two brachials,

including the more broadly rounded median keel, which grade insensibly into those on the slightly everted borders of these segments (Postillon Islands; 794 Metres). *margaritifera*

1. *Thalassometra margaritifera* A. H. Clark.

A. H. Clark. Zool. Anzeiger, vol. 39, 1912, N° 11/12, p. 426 (*Thalassometra margaritifera*).

Stat. 45. 7° 24′ S., 118° 15′.2 E. Flores Sea. 794 Metres. 2 Ex.

This species is very closely related to *Th. hirsuta*; the eversion of the proximal and distal edges of the ossicles of the IBr series and of the first two brachials is less marked than in *Th. hirsuta* and the spinosity is coarser, the spines being more uniform in size and more thickly distributed over the dorsal surface of the segments; they are also longer, so that there is less difference between the spines of the dorsal surface and those of the everted edges; the median carination is more rounded than that of *Th. hirsuta*, and is studded with spines resembling those of the general dorsal surface.

The cirri are about 45 mm. long, with somewhat more that 57 segments; the arms are about 95 mm. long, in *hirsuta* being 95 mm. to 100 mm. long.

2. *Thalassometra hirsuta* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 552 (*Thalassometra hirsuta*).

Stat. 85. 0° 36′.5 S., 119° 29′.5 E. Makassar Straits. 724 Metres. 7 Ex.
Stat. 286. 8° 50′.2 S., 127° 2′.2 E. Timor Sea. 883 Metres. 1 Ex.

A specimen from Stat. 85 may be described as follows:

The centrodorsal is small, low, rounded conical; the dorsal pole is thickly studded with small more or less sharpened papillae; the cirrus sockets are arranged in ten columns, closely crowded, of two sockets each.

The cirri are XX, 60—64, 40 mm. to 45 mm. long; the longest proximal cirrus segments are from two and one half to three times as long as broad; the eversion of the distal edges of the segments begins on the fith or sixth.

The dorsal surface of the ossicles of the IBr series and of the first two brachials is uniformly and rather thickly covered with short fine spines; their proximal and distal edges are everted and armed with very numerous fine spines which are more closely set and longer than those on the dorsal surface; the IBr_1 and the proximal half of the median line of the axillary bears a moderately sharp, though low, median keel which is studded with slender spines; more or less complete reduplications of this keel occur on the first two brachials; beyond the first syzygy the spines become finer, shorter, more thickly set, and more evenly distributed, as the ends of the brachials become oblique gradually giving way the finely serrate longitudinal striations.

The base of the animal is moderately compact, the outer edges of the ossicles of the IBr series and lower brachials being straight and in close apposition. Rather small water pores are present.

The specimen from Stat. 286 is slightly smaller and more slender than the preceding, with the spinosity of the IBr series and first two brachials very slightly finer and thicker. The arms are 80 mm. long; the cirri are 27 mm. long with 44—51 segments.

3. *Thalassometra pubescens* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, p. 139 (*Antedon pubescens*).

4. *Thalassometra marginata* A. H. Clark.

A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 206 (*Thalassometra marginata*).

5. *Thalassometra pergracilis* A. H. Clark.

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 107, pl. 12, figs. 3—5; pl. 15, figs. 1—4 (*Antedon gracilis*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, part 3, 1907, p. 360 (*Thalassometra pergracilis*).
—— Crinoids of the Indian Ocean, 1912, p. 207 (*Thalassometra pergracilis*; references, but not the specimen recorded).

I am now convinced that the specimen from the Andaman Islands in about 485 fathoms of water which I recorded as *Thalassometra pergracilis* does not in reality represent that species. It is in too poor condition for definite determination.

6. *Thalassometra hawaiiensis* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 152 (*Antedon hawaiiensis*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 222 (*Thalassometra hawaiiensis*).

7. *Thalassometra agassizii* (Hartlaub).

HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 28, 1895, N° 4, p. 131, pl. 1, figs. 4, 7, 8; pl. 2, figs. 16, 18, 19; pl. 3, fig. 23 (*Antedon agassizii*).

8. *Thalassometra bispinosa* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 115, pl. 20, figs. 3, 4 (*Antedon bispinosa*).
A. H. CLARK. Die Crinoiden der Antarktis, 1915, p. 112 (*Thalassometra bispinosa*).

9. *Thalassometra villosa* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 138 (*Antedon villosa*).

10. *Thalassometra latipinna* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 116, pl. 10, fig. 3 (*Antedon latipinna*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 46 (*Thalassometra latipinna*).

11. *Thalassometra echinata* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 119, pl. 21, figs. 4, 5 (*Antedon echinata*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1915, N° 15, p. 46 (*Thalassometra echinata*).

12. *Thalassometra multispina* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 248, pl. 13, figs. 1—3; pl. 14, figs. 5—7; pl. 50, figs. 3—6; pl. 69, figs. 1—4 (*Antedon multispina*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 1, p. 47.

13. *Thalassometra omissa* (Koehler).

KOEHLER. Échinodermes provenant des campagnes du yacht "Princesse-Alice", 1909, p. 268, pl. 33, fig. 10 (*Antedon omissa*).

14. *Thalassometra attenuata* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 147 (*Thalassometra attenuata*).
—— Crinoids of the Indian Ocean, 1912, p. 204, fig. 38, p. 205 (*Thalassometra attenuata*).

15. *Thalassometra lusitanica* (P. H. Carpenter).

P. H. CARPENTER, Proc. Roy. Soc. Edinburgh, vol. 12, 1884, p. 368 (*Antedon lusitanica*).
—— "Challenger" Reports. Comatulae, 1888, p. 109, pl. 39, figs. 1—3 (*Antedon lusitanica*).
—— Journ. Linn. Soc. (Zoöl.), vol. 24, 1892, p. 65 (*Antedon lusitanica*).
KOEHLER. Échinodermes provenant des campagnes du yacht "Princesse-Alice", 1909, p. 267, pl. 1, figs. 7, 8; pl. 32, figs. 12—14 (*Antedon lusitanica*).
—— et VANEY. Bull. du Mus. d'hist. nat., Paris, 1910, N° 1, p. 31 (*Antedon* [*Crotalometra*] *lusitanica*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 46 (*Thalassometra lusitanica*).

X. Family CHARITOMETRIDAE A. H. Clark.

Key to the Genera of the Family Charitometridae.

a¹ Proximal pinnules over twice as long as the very short middle and distal pinnules, and strongly carinate; arms usually from 20 to 30 in number; IIBr series 4 (3 + 4) or 2, or both in the same individual; IIIBr series 2 (1 + 2), internally developed; ossicles of the division series and lower brachials usually with a more or less complex and highly developed tubercular ornamentation, though sometimes plain (West Indies; 121—720 Metres) . . . . . Crinometra

a² Proximal pinnules much less than twice as long as the middle and distal pinnules, usually only slightly, or not at all, longer

b¹ small (arm length less than 60 mm., rarely over 45 mm.), with not more

than 12 cirrus segments; the division series usually make a large angle with the dorsoventral axis so that the lower part of the animal is broad and rounded; from three to six of the segments of the genital pinnules are greatly expanded, forming a roof over the gonads; 10 arms (Kei Islands and the Molucca Sea to southwestern Japan; 180—1264 Metres) . . . . . **Strotometra**

b² larger, with at least 15 cirrus segments; the division series usually make a relatively small angle with the dorsoventral axis so that lower part of the animal is more or less narrow

c¹ the ossicles of the division series and earlier brachials are relatively narrow and well separated from their neighbors laterally, but the gap between them is more or less completely bridged by a thin flange-like lateral production of the dorsolateral borders of the ossicles as for as the fourth or fifth brachials; from three to five of the segments of the genital pinnules are greatly expanded, roofing over the gonads; 10 arms from 100 mm. to 110 mm. long (Meangis Islands and southwestern Japan; 650—900 Metres). . . . . **Poecilometra**

c² the ossicles of the division series and lower brachials are in close apposition, and are sharply flattened against their neighbors

d¹ genital pinnules abruptly expanded, the third and fourth segments broad and nearly flat on the outer side, but the fifth smaller; IBr series and arm bases diverging at a relatively small angle so that the lower part of the animal appears bluntly conical; 10 arms 90 mm. to 100 mm. long (Kermedec Islands and Fiji; 1134—2430 Metres). . . . . **Charitometra**

d² genital pinnules usually only slightly expanded the expansion always involving a number of segments and always tapering away evenly distally

e¹ arms stout at the base, becoming strongly compressed laterally in the outer portion; the mid-dorsal line of each brachial is elevated into a broad, high, blunt overlapping spine or tubercle; the ossicles of the division series and the first two brachials have the central portion elevated so that their dorsal surface is in the shape of a broadly V-shaped gable; the cirrus sockets are arranged in one irregular, or two regular, columns in each radial area; cirri XV—XXX, 18—28, varying from short to very long; 10 arms from 75 mm. to 211 mm. in length (Timor to the Meangis and Philippine Islands; 520—1314 Metres) . . . . . **Chondrometra**

e² outer portion of the arms not compressed laterally; the mid-dorsal line of the outer brachials may be evenly rounded, or

may bear a low, blunt or sharp, carinate ridge which, however, is never elevated into an overlapping spine or tubercle

f¹ a low sharp median keel of uniform height on the ossicles of the division series and all, or nearly all, of the brachials; ossicles of the division series and earlier brachials with abruptly everted borders and more or less numerous small tubercles or capitate spines scattered over the dorsal surface; 10—18 (usually 10—12) arms 100 mm. to 140 mm. long; IIBr 2 or 4 (3 + 4); cirri XV—XX, 13—15 (Philippine Islands; 92—761 Metres) . . . . . Glyptometra

f² dorsal surface of the ossicles of the division series and brachials evenly rounded, or with a blunt median carination, or a broad low median tubercle, never with a low sharp median keel; proximal and distal borders of the ossicles of the division series and of the lower brachials never everted and standing up at right angles to the general surface of the segments; no definite isolated small tubercles or capitate spines on the dorsal surface of the ossicles of the division series or earlier brachials, which are dorsally evenly rounded, irregularly rugose, or bluntly carinate

g¹ centrodorsal more or less conical, with the cirrus sockets arranged in ten definite columns, two in each radial area

h¹ 26—33 arms; IIBr series always 4 (3 + 4) (Kei Islands to the Malay Archipelago, the Philippine Islands and southern Japan; 54—403 Metres) Crossometra

h² not more than 20 (usually 10—20) arms; IIBr series, when present, usually 4 (3 + 4), sometimes 2 (Laccadive Islands to Timor and the Kei Islands, and northward to the Philippines and southern Japan; 73—1269 Metres) . . Perissometra

g² centrodorsal thick discoidal or more or less columnar, the cirrus sockets arranged in 15 crowded columns

h¹ 12—28 arms

i¹ all division series 2; extremely brittle and easily broken at the synarthries; 15—19 arms; cirri XXX, 19 (Moluccas and Philippine Islands; 118—243 Metres). . . . . Monachometra

i² IIBr series 4 (3 + 4); tough, the arms, rarely broken at the base during capture; 14—28 arms; cirri XX—XXX, 15—24 (South Africa to the Philippine Islands and Fiji; 360—1314 Metres) Pachylometra

h² 10 or 11 (only exceptionally more than 10) arms; IIBr series, if present, 2

i¹ large; proximal portion of animal very broad and well rounded, the profile of the division series and arm bases strongly convex; ossicles of the division series and arm bases with the lateral borders strongly, the proximal and distal less strongly, everted, unmodified, finely tubercular, or crenulate, and with a narrow blunt median keel; brachials usually each with a prominent, though low, small rounded median tubercle which beyond the middle of the arm gradually becomes obsolete; cirrus segments slightly constricted centrally, with prominent ends; stout with 10 (exceptionally 11) arms 160 mm. to 180 mm. long; cirri about XXX, 15—21 (usually 16—19) (Hawaiian Islands; 574—812 Metres) . . . **Calyptometra**

i² small; proximal portion of animal narrow, the profile of the division series and arm bases diverging, in approximately a straight line, at a relatively small angle with the dorsoventral axis; dorsal surface of the division series and first four brachials rising evenly, and rather steeply into a low and very blunt median keel, which becomes obsolete in the outer half of the arms; cirrus segments with unmodified proximal and distal borders; slender, with 11 arms 65 mm. long; cirri XV, 16, 20 mm. long (southwestern Japan; 171 Metres) . . . . **Chlorometra**

Crossometra A. H. Clark.

Key to the Species of the Genus Crossometra.

a¹ Proximal portion of the animal appearing narrow, the profile of the division series in lateral view nearly straight, making an angle of about 45° with the dorsoventral axis, or an angle of about 90° with each other; 29—32 arms 150 mm. long; cirri XXV—XL, 23—26, 30 mm. to 40 mm. long (Timor to the Malay Archipelago and the Philippine Islands; 54—520 Metres) . . . . . *investigatoris*

a² Proximal portion of the animal very broad and well rounded

b¹ distal cirrus segments about as long as their distal diameter, with the mid-dorsal line sharpened, but not produced; division series evenly rounded dorsally, with no trace of tubercles on the individual ossicles (Moluccas; 310 Metres) . . . . . *helius*

b^2 distal cirrus segments broader than long, and bearing a high narrow sharp keel the crest of which is parallel to the axes of the segments; each of the elements of the division series bears a more or less developed low rounded median tubercle (southern Japan; ? depth) . . . . *septentrionalis*

1. *Crossometra investigatoris* (A. H. Clark).

A. H. Clark. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 82 (*Pachylometra investigatoris*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 556 (*Pachylometra luna*).
—— Crinoids of the Indian Ocean, 1912, p. 216, fig. 39, p. 217 (*Pachylometra investigatoris*).

Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres. 3 Ex.

The largest specimen has 20 arms 110 mm. long; there are no IIIBr series; the cirri are 30 mm. long with 22—23 segments; another has 21 arms; the third has 18 arms about 90 mm. long.

2. *Crossometra helius* (A. H. Clark).

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 78 (*Pachylometra helius*).

Stat. 254. 5° 40′ S., 132° 26′ E. 310 Metres. 5 Ex.

The centrodorsal is of moderate size, flattened hemispherical or thick truncated conical, 6 mm. in diameter at the base, 3 mm. across the flat dorsal pole and 4 mm. high; the cirrus sockets are arranged in ten equally separated columns of two or three each.

The cirri are about XXV, 23, about 28 mm. long; the first segment is short, the following gradually increasing in length to the fifth and sixth which are the longest, between one third and one half again as long as broad; the following segments very slowly decrease in length so that those in the distal third of the cirri are about as long as the distal diameter; in the distal third of the cirri the median portion of the distal dorsal edge of the segments is somewhat swollen, this on the last five or six before the penultimate becoming a blunt subterminal dorsal tubercle; the opposing spine is prominent, short, sharp, terminal, directed obliquely forward.

The ends of the basal rays are visible as large rhombic tubercles in the angles of the calyx; the radials are entirely concealed; the IBr_1 are very short, broadly V-shaped with the proximal and distal edges parallel; the lateral thirds of the proximal and distal edges are slightly produced; the axillaries are very short, nearly or quite three times as broad as long, rhombic in shape with concave sides and truncated lateral angles, the lateral edges being as long as those of the IBr_1; the lateral edges and all but the median portion of the proximal edge are very slightly produced; the synarthrial tubercles are low and broad, scarcely evident.

The contour of the proximal portion of the animal is broadly rounded, as in *C. septentrionalis*.

The 26 arms are 125 mm. long; there are seven IIBr 4 (3 + 4) and three IIBr 2 series; the IIIBr series are 2, internally developed except for one, which is situated by the side of an internal IIIBr series.

The dorsal portion of the basal segments of P_D is visible between the IIBr series.

The dorsal profile of the arms is smooth.

A similar specimen has 28 arms; eight of the IIBr series are 4 (3 + 4) and two are 2; the cirri are from 25 mm. to 34 mm. long with 20—23 segments.

The remaining three examples are small, with 20, 19 and 17 arms.

3. *Crossometra septentrionalis* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 312 (*Charitometra distincta*).
—— Proc. U. S. National Museum, vol. 39, 1911, 554 (*Pachylometra septentrionalis*).

Perissometra A. H. Clark.

Key to the Species of the Genus Perissometra.

a_1 Proximal portion of the animal abruptly constricted, the sides of the IBr series, as seen in lateral view, being nearly parallel, but the sides of the IIBr series and arm bases divergent; 14—20 arms 75 mm. long; IIBr 4 (3 + 4); cirri XX—XXV, 18—23, all, or most, of the segments longer than broad (Meangis Islands; 900 Metres) . . . . . *angusticalyx*

a^2 No constriction of the proximal portion of the animal

b^1 14—20 (usually 20) arms

c^1 IIBr 2; rather slender; cirri with all of the component segments longer than broad

d^1 ossicles of the division series and brachials each with a broad low inconspicuous median keel which persists to the end of the arms; distal edges of the discoidal brachials beyond the second prominently and abruptly everted, of the more distal triangular brachials produced and overlapping; arms 14—20, 170 mm. to 175 mm. long; cirri rather short and weak, XX—XXX, 17—22, 30 mm. to 37 mm. long (Sahul Bank and the Kei Islands to the Philippines; 104—140 Metres). . . . . *patula*

d^2 ossicles of the division series with the dorsal surface unmodified, or with a more or less developed broad rounded tubercle; no eversion of the distal borders of the brachials; 12—16 arms 250 mm. long; cirri very long and stout, XX—L, 18—31 (usually 28—31) 55 mm. to 70 mm. long (Sahul Bank and Timor to the Kei Islands; 252—520 Metres). . . . . *robusta*

c^2 IIBr 4 (3 + 4); stout; ossicles of the division series and brachials each with a low median rounded tubercle which becomes obsolete in the outer half of the arms

d^1 brachials with smooth and unmodified distal edges and a slightly swollen dorsal surfaee; profile of the division series and arm bases diverging at an angle of slightly less than 90°; arms 205 mm. long;

cirri XXX, 17—19, 25 mm. to 30 mm. long, the distal segments broader than long (Philippine Islands; ?depth) . . . . . *selene*

d^2 brachials with prominently swollen and produced distal borders and sunken dorsal surface; profile of the division series and arm bases diverging at an angle of more than 90°; arms about 170 mm. long; cirri XXIV, 19—24 (usually 21), 25 mm. to 40 mm. (usually 30 mm. to 35 mm.) long, the distal segments slightly longer than broad (Kei Islands and Timor; 73—310 Metres) . . . . *gorgonia*

b^2 not more than 13 arms

c^1 all of the cirrus segments much broader than long, those in the distal half of the cirri twice as broad as long; ossicles of the division series and first four brachials with the dorsal surface raised into a broad blunt keel, highest and most conspicuous on the first maned; brachials in the proximal fourth or third of the arm with indications of a broad low median tubercle; 10 arms 165 mm. long; cirri XX, 17—20, 20 mm. to 25 mm. long, very stout (Timor; 520 Metres). . . . . *timorensis*

c^2 several, or most, of the cirrus segments as long as, or longer than, broad

d^1 cirri very stout, none of the segments longer than the distal diameter, the outer broader than long, each with a prominent blunt carinate process; ossicles of the IBr series with a plain and even surface, or with a slight indication of a broad rounded median keel; brachials with an unmodified dorsal surface; 10—11 stout arms about 180 mm. long; IIBr 4 (3 + 4); cirri XXV, 18—22 (usually 20), 32 mm. long (Kei Islands; 487 Metres) . . . . . *crassa*

d^2 cirri more slender, most, or all, of the segments slightly longer than broad; ossicles of the division series and first two brachials with the median portion elevated into prominent broad keels or prominent, more or less irregular, tubercles

e^1 less than 20 (usually 15—18) cirrus segments; the median portion of the ossicles of the IBr series and first two brachials is abruptly raised into an irregular rounded tubercle; the remainder of the dorsal surface of these ossicles is very uneven, and the proximal and distal borders are more or less irregularly crenulate; 10 arms 115 mm. long; cirri XX, 15—20 (usually 15—18), 21 mm. long, the outer cirrus segments bear small blunt terminal tubercles (southern Japan; 650 Metres) . . . . . *lata*

e^2 more than 20 (20—31) cirrus segments

f^1 the dorsal surface of the ossicles of the division series and first two brachials is rather sharply convex, rising into a broadly rounded median ridge with a more or less distinct median tubercle, so that the interradial angles appear sunken in a

V-shaped groove; 10—13 arms 175 mm. long; IIBr 2; cirri XX—XXV, 20—25, most of the segments longer than broad, the outer without terminal tubercles (Kei Islands; 252 Metres) *flexilis*

f^2 the dorsal surface of the ossicles of the IBr series and first two brachials is not elevated, but bears more or less prominent oval or rounded median tubercles

g^1 division series all 2; ossicles of the division series and first two brachials with slightly developed broad median tubercles, or none at all; there is no eversion of the adjoining lateral edges of these ossicles; cirri very long and stout, XX—L, 18—31 (usually 28—31), 55 mm. to 70 mm. long, the outer segments markedly longer than broad; 12—16 arms 250 mm. long (Sahul Bank, the Kei Islands and Timor; 252—520 Metres). . . . . *robusta*

g^2 IIBr series 4 (3 + 4); ossicles of the division series and first two brachials with large and prominent oval or rounded median tubercles, with rise more or less abruptly; the adjoining lateral edges of these ossicles are slightly everted; cirri XX—XXIII, 20—22, moderate in size, rather slender, the longest proximal segments about half again as long as broad, those in the terminal third slightly longer than broad, the last two or three before the penultimate with slight traces of dorsal tubercles

h^1 ossicles of the division series and first two brachials with low broad median tubercles; proximal subquadrangular brachials with the distal ends thickened and everted, and with small rounded median tubercles; remaining brachials with rather prominently overlapping distal ends; 12 arms 170 mm. long; cirri XXIII, 20—21, 30 mm. to 34 mm. long (Andaman Islands; 1024 Metres) . . . . *invenusta*

h^2 ossicles of the division series and first two brachials with smaller, prominent, rather high median tubercles; proximal subquadrangular brachials unmodified; brachials beyond without prominent distal ends; 13 arms 170 mm. long; cirri XX, 21—22, 25 mm. to 36 mm. long (Laccadive

y Islands; 1269 Metres). . . . . *macilenta*

1. *Perissometra angusticalyx* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 242, pl. 2, fig. 4*a*—*d*, pl. 30, figs. 1, 2; fig. 5B, p. 246 (*Antedon angusticalyx*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 47 (*Pachylometra angusticalyx*).

2. *Perissometra selene* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 556 (*Pachylometra selene*).

3. *Perissometra gorgonia* sp. nov.

Stat. 254. 5° 40′ S., 132° 26′ E. Arafura Sea. 310 Metres. 1 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. Timor Sea. 73 Metres. 1 Ex.

The centrodorsal is small, apparently conical, the cirrus sockets arranged in ten closely crowded columns.

The cirri are XXIV, 19—24 (usually 21), 25 mm. to 40 mm. (usually 30 mm. to 35 mm.) long; the segments are very uniform in length, the sixth or seventh and following being slightly longer than broad; the distal edges of the segments are slightly prominent, and the distal edges of those in the outer half are slightly thickened on the dorsal side. The cirri are relatively larger and stouter than those of *P. selene*.

The ends of the basal rays are visible as very large rhombic or rounded triangular low tubercles or flat areas in the angles of the calyx. The radials are concealed. The IBr_1 are extremely short, in the angles of the calyx running far upwards and meeting over the ends of the basal rays; they bear a low broad median tubercle. The axillaries are rhombic, about two and one half times as broad as long; except in the median line their edges, like those of the IBr_1, are slightly everted; they bear a large low broad median tubercle.

The 20 arms are about 170 mm. long; all ten of the IIBr series are 4 (3 + 4); each of the component ossicles carries a low rounded median tubercle, and has slightly thickened edges all around. The earlier brachials have slightly thickened and more or less everted distal edges, which as the brachials become triangular change to simple overlapping distal ends; traces of a low rounded median tubercle may be found at least as far as the end of the proximal third of the arm.

The specimen from Stat. 254 has 17 arms 130 mm. long; five of the IIBr series are 4 (3 + 4) and two are 2; the cirri are rather slender, XXV, 14—16, 16 mm. long.

4. *Perissometra patula* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 219, pl. 43 (*Antedon patula*).
BELL. Journ. Linn. Soc. (Zoöl.), vol. 24, 1893, p. 341, (*Antedon patula*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 48 (*Pachylometra patula*).

5. *Perissometra robusta* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 220, pl. 44, figs. 1 (*Antedon robusta*).
BELL. Journ. Linn. Soc. (Zoöl.), vol. 24, 1893, p. 341 (*Antedon patula*, part).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 49 *Pachylometra robusta*).

Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres. 2 Ex.

One of the specimens has the cirri 55 mm. to 70 mm. long, composed of 28—31

segments of which the first four are short, the following gradually incressing in length to the ninth which, with the following, is about half again as long as broad; the distal ventral edge of each segment projects slightly above the base of the succeeding segment; the last six or seven segments taper very gradually so that the cirri, which troughout most of their length are about 2 mm. broad, become on the penultimate segment 1.2 mm. broad; the opposing spine is represented by a very slight terminal tubercle; the penultimate and the distal third of the antepenultimate segment (sometimes the penultimate and antepenultimate and the distal third of the preceding) are highly polished in contrast to the dull surface of the preceding ossicles.

The centrodorsal is large and thick, truncated conical, 8 mm. broad at the base and 3.6 mm. across the stellate dorsal pole, 6 mm. high; the cirrus sockets are arranged in ten closely crowded columns of two each, with one in the centre of a radial depression and one on an interradial ridge; on the proximal edge of the centrodorsal there are rounded interradial ridges which are produced distally in a sharp angle between the proximal portion of the proximal cirrus sockets, which meet below them; proximally these fork, becoming prominent rather high tubercular processes on either side of the end of the basal ray, which they much resemble, the surface of the stellate dorsal pole is slightly concave in the centre, with more or less marked radial and interradial grooves; the ends of the rays of the star are not interradial, but are somewhat twisted clockwise so that they come under the left colum of cirrus sockets in each radial area.

The ends of the basal rays are visible as prominent dorsoventrally elongate tubercles in the angles of the calyx.

The edge of the radials is just visible beyond the centrodorsal.

The IBr_1 are very short, with parallel sides, distally incised by a rounded posterior projection from the axillary, laterally curving upward and meeting over the ends of the basal rays; the distal inner angles are somewhat cut away; the median third of the dorsal surface is swollen, forming a more or less evident laterally elongated large low rounded tubercle; the proximal edge is slightly produced, especially in the lateral thirds; the distal outer angles are slightly swollen.

The IBr_2 (axillaries) are rhombic, twice as broad as long; the edges are slightly raised; the dorsal surface, except in the lateral thirds, is slightly raised, most prominently in the median line just within the proximal border and on the median part of the two distal faces, just within the distal borders; the lateral angles are more or less irregular, with a greater or lesser tubercular modification; the lateral edges are more or less cut away, forming, with a similar truncation of the distal angles of the IBr_1, a prominent water pore.

There are fourteen arms, all in process of regeneration; the $IIBr_1$ series are all 2, resembling the IBr series and with the same water pores, but with the outer edges more irregularly tuberculous; the first two brachials are similar to the elements of the division series, and have water pores interiorly and exteriorly between them; the remaining brachials have a smooth and unmodified surface, as figured by CARPENTER; but this is possibly due to the fact that as yet they are incompletely regenerated.

The other specimen is essentially similar; there are sixteen arms, all of the IIBr series

being 2; all of the arms except three, which are broken, are regenerating. The tubercles on the ossicles of the division series and on the first two brachials are not quite so extensive, though slightly more marked; the proximal and distal borders of these segments except in the median line are slightly produced and slightly scalloped, this increasing progressively to to the margin; the lateral edges are similarly produced and slightly swollen, but nearly straight without tubercular modification; very narrow transversely elongate slits, scarcely noticeable, mark the position of the future water pores.

These specimens appear to belong to CARPENTER's *robusta*, though they are more developed than his type. The chief characteristic of the species is the very long and stout cirri.

6. *Perissometra macilenta* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 81 (*Pachylometra macilenta*).
—— Crinoids of the Indian Ocean, 1912, p. 222, fig. 41, p. 223 (*Pachylometra macilenta*).

7. *Perissometra invenusta* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 149 (*Pachylometra invenusta*).
—— Crinoids of the Indian Ocean, 1912, p. 220, fig. 40, p. 221 (*Pachylometra invenusta*).

8. *Perissometra crassa* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 77 (*Pachylometra crassa*).

Stat. 259. 5° 29'.2 S., 132° 52'.5 E. Between Kei Islands. 487 Metres. 2 Ex.

The centrodorsal is very large, truncated conical, the sides making a rather small angle with each other, 9 mm. in diameter at the base, 5 mm. across the irregularly convex dorsal pole, and 5 mm. high; the cirrus sockets are arranged in ten columns, usually three to a column, the columns being closely crowded interradially, slightly separated radially.

The cirri are about XXV, 18—22 (usually 20), 25 mm. to 32 mm. long, stout and short segmented; the first segment is short, the following gradually increasing in length so that the sixth and following are nearly as long as broad, those in the outer third of the cirri being slightly shorter again; on the seventh a slight broad subterminal dorsal hump makes its appearance which slowly increases in height so that the terminal nine possess a prominent broad blunt and well rounded subterminal tubercle which becomes more pointed on the last two or three before the penultimate; the opposing spine is small, subterminal, resembling the tubercle on the preceding segment, but arising from a much smaller base.

The radials and the ends of the basal rays are concealed; the IBr_1 are very short, broadly V-shaped, sometimes concealed in the median line so that only the lateral portions are visible; the dorsal surface is more or less irregular; the axillaries are short and broad, nearly three times as broad as long, rhombic, the lateral angles truncated so that the lateral sides are nearly or quite as long as those of the IBr_1.

The arms are 10 or 11 in number, about 180 mm. long; the IIBr series are 4 (3 + 4); the first two brachials are about equal in size, slightly wedge-shaped (more pronouncedly so

on the second), about three times as broad as the median length; the broad smooth synarthrial tubercles are scarcely marked; the brachials have slightly produced distal edges and a more or less swollen dorsal surface.

9. *Perissometra flexilis* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 217, pl. 42 (*Antedon flexilis*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 48 (*Pachylometra flexilis*).

10. *Perissometra lata* (A. H. (Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 129 (*Antedon lata*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 312 (*Charitometra lata*).

11. *Perissometra timorensis* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 80 (*Glyptometra timorensis*).

Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres. 4 Ex.

The centrodorsal is very thick discoidal, the sides sloping slightly inward, 6.5 mm. in diameter at the base (5 mm. in the smaller specimen) and 3 mm. high (2.5 mm. in the smaller); the cirrus sockets are arranged in ten columns of two each, the columns closely crowded against each other and showing no differentiation into pairs.

The cirri are XX, 17—20, 20 mm. to 25 mm. long, stout; the first segment is very short, the following gradually increasing in length to about the seventh which, with the following, is about twice as broad as the median length or, in the longest cirri, half again as long as the median length; the dorsal profile of the segments beyond the seventh or eighth is convex, becoming gradually more strongly so toward the end of the cirri.

In the smaller specimen the median portion of the distal dorsal edge of the segments is slightly raised, and at the same time a broadly rounded carination appears which slowly becomes higher and narrower, and very prominent on the segments beyond the eighth; this carination has a straight distal border which is parallel to the longitudinal axis of the segments. In the larger specimen there is only a mere trace of this carination, which is very broadly rounded off so that in lateral view the segments are regularly convex dorsally.

The ends of the basal rays are visible as flat triangular or irregular areas in the angles of the calyx; the radials are entirely concealed, or are slightly visible as small irregular tubercles or flat irregular areas in the angles of the calyx; the IBr_1 are short, broadly chevron-shaped, the proximal and distal borders parallel, about four times as broad as long; the proximal edge is produced into a thin border overlapping and concealing the proximal portion of the centrodorsal, though flush with its general surface; the border of this produced proximal edge is usually irregularly scalloped or bears a few low coarse teeth, though it may be nearly plain: it sometimes bears a few low tubercles; it may be evenly curved, becoming horizontal just

over the ends of the basal rays, or it may be regularly curved in its lateral thirds but nearly straight in its median third; the middle of the dorsal surface of the IBr_1 is occupied by a large prominent broadly oval well rounded tubercle; the axillaries are broadly rhombic with the lateral angles truncated so that the lateral edges are from one half to two thirds the length of the sides of the IBr_1, two and one half times as broad as long, in the median line nearly twice as long as the IBr_1; the centre, except at the anterior angle, is occupied by a tubercle which is more elongated dorsoventrally than that on the IBr_1 and, though as high, less prominent as it rises much less abruptly; the lateral edges of the IBr_1 and the IBr_2 are turned slightly outward; the lateral thirds of the proximal edge of the axillaries and the corresponding portions of the distal edge of the IBr_1 are also turned upward to the same height as the lateral edges; the eversion of the latter is most marked just over the ends of the basal rays and gradually decreases anteriorly to the distal corner of the lateral edge of the axillary; it is continued thence along the sides of the first four brachials; the inner lateral edges of the first five brachials are similarly modified.

Fig. 7.
Lateral view of a specimen of *Perissometra timorensis* from Stat. 297. Natural size. (Courtesy of the U. S. National Museum).

The arms are, in the type, 165 mm. long.

The first brachial is wedge-shaped, slightly longer exteriorly than interiorly, twice as broad as the exterior length; the proximal border is narrowly produced; the outer border is produced like the lateral borders of the axillaries; the inner border is similarly produced, especially at the distal angle, which is more or less rounded off and overlaps the proximal inner angles of the second brachial. The second brachial is about the size and shape of the first, with the outer edge similarly produced; the production of the inner edge is like that of the outer, but not so marked. The third and fourth brachials form a syzygial pair which is oblong, about twice as broad as long, with the lateral edges turned outward as in the brachials preceding; the following brachials are slightly wedge-shaped, about twice as broad as long; one brachial between the

ninth and thirteenth (usually the eleventh) is oblong, and the following quickly become triangular, about as long as broad.

The first four brachials have a low very broadly rounded median carination which is very obscure; the following have an equally obscure slight very broad convexity in the middle of the dorsal surface which after the eight or ninth becomes smaller in area and resolves itself into a low rounded tubercle witch gradually disappears after the end of the proximal third, though it may be detected as far as the end of the proximal half.

The ornamentation of the smaller specimen is similar, but the tubercles on both elements of the IBr series are slightly narrower so as to appear as a broadly rounded carination.

One of the specimens is six-rayed.

Pachylometra A. H. Clark.

Key to the Species of the Genus Pachylometra.

a^1 Cirri rather short and very stout, the segments very slightly, if at all, longer than broad, the outer more or less distinctly carinate, but without terminal tubercles; cirri XX—XXV, about 20; 20 arms 100 mm. long (Kermadec Islands to Fiji; 1134—2430 Metres). . . . . *inaequalis*

a^2 Cirri longer and less stout, the longer proximal segments half again to twice as long as broad

b^1 20—28 arms

c^1 outer cirrus segments only slightly shorter than the more proximal, at least one third again as long as broad, with no trace of dorsal tubercles; 15—20 cirrus segments; 20 arms about 80 mm. long (off East London, South Africa; 450—540 Metres) . . . . . *sclateri*

c^2 outer cirrus segments much shorter than the longer proximal, at most only very slightly longer than broad and usually slightly broader than long, with prominent terminal tubercles on the mid-dorsal margin; cirri XXVI—XXX, 19—24; 21—28 arms 100 mm. to 155 mm. long (Philippine Islands; 360—761 Metres) . . . . . *distincta* [1])

b^2 12—14 arms, 100 mm. long; cirri XXX—XXXV, 14—15, 15 mm. long (Philippine Islands; 889—1316 Metres) . . . . . *levigata*

1. *Pachylometra inaequalis* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Stalked Crinoids, 1884, pl. 54, fig. 8 (*Antedon inaequalis*).

—— "Challenger" Reports. Comatulae, 1888, p. 144, pl. 2, figs. 5*a*—*d*; pl. 51, fig. 2; text figure 5 A, p. 246 (*Antedon inaequalis*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 48 (*Pachylometra inaequalis*).

1) Synonym: *Charitometra smithi* A. H. Clark, 1908.

2. *Pachylometra sclateri* (Bell).

BELL. Marine Investigations in South Africa, vol. 4, 1905, p. 140, pl. 3, figs. 1—3 (*Antedon sclateri*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N⁰ 15, p. 48 (*Pachylometra sclateri*).

3. *Pachylometra distincta* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 247, pl. 51, fig. 1 (*Antedon distincta*).
A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 227 (*Charitometra smithi*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 555 (*Pachylometra distincta*); p. 557 (*Pachylometra smithi*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N⁰ 15, p. 48 (*Pachylometra distincta*).

4. *Pachylometra levigata* A. H. Clark.

A. H. CLARK. Proc. U.S. National Museum, vol. 36, 1909, p. 406 (*Pachylometra levigata*).

Monachometra A. H. Clark.

There is only one species in the genus *Monachometra*.

1. *Monachometra fragilis* (A. H. Clark).

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 79 (*Pachylometra fragilis*).

Stat. 166. 2° 28'.5 S., 131° 3'.3 E. Halmahera Sea. 118 Metres. 1 Ex.

The centrodorsal is low, flattened hemispherical, 7 mm. in basal diameter and 3 mm. high; the cirri are closely crowded, arranged in two or three irregular rows and approximately fifteen columns, three in each radial area; the cirrus sockets in the proximal row reach the proximal border of the centrodorsal. The centrodorsal in general resembles that of the species of *Crinometra*.

The cirri are about XXX, 17—18, 30 mm. to 35 mm. long, moderately slender; the first four segments are short, the fifth half again as long as broad, the sixth, seventh and eight twice as long as broad, the following gradually decreasing so that the distal are about as long as broad, and the terminal increasing again so that the penultimate and antepenultimate are about twice as long as broad; the longer proximal segments have slightly prominent ends, while the shorter distal have the dorsal distal margin slightly swollen.

Deep, but very narrow, subradial clefts are present.

The ends of the basal rays are large and prominent, forming rhombic areas in the angles of the calyx.

The radials are very short, strongly curved, with a low, broad and obscure median tubercle.

The IBr_1 are exteriorly very short, band-like, with an obscure low median tubercle; inwardly they are produced toward the centre of the calyx so that their sharply flatened

lateral edges almost meet, being separated only by a narrowly V-shaped cleft running to the edge of the inner edge of the synarthrial joint face; though the dorsal surface of the segment is well rounded, the distance from the central canal to the median part of the dorsal edge is not so great as the distance from the central canal to the inner angle; counting the entire median length of the joint face the broadest portion is found to be scarcely more than one third of the distance from the dorsal edge to the inner angle; the ossicle is sharply "wall-sided" from its widest point inward; the axillaries are low, rhombic, with the lateral angles truncated so that lateral edges are about as long as the lateral edges of the IBr^1 twice as broad as long; there is an obscure well rounded median carination; the distal angle is produced, but broad; the dorsal surface is rather strongly convex; the lower portions of the axillaries are strongly produced inward so that, as in the case of the IBr_1, the inner sides are reduced almost to apices which nearly meet the similar inner ends of the other axillaries; from this central point the inner face of the axillaries slopes away almost horizontally so that the inner faces of the axillaries, together with the division series, form the platform upon which the visceral mass rests; the sides of the inner half of the axillaries are sharply "wall-sided"; the IIBr series are similar to the IBr series, but rapidly decrease in dorsoventral width; they are sharply flattened laterally for somewhat more than their inner half; the first two brachials are flattened laterally for their entire inner side, and the third and fourth are flattened on the inner portion of the inner side.

The nineteen arms are 145 mm. long. All of the IIBr series are 2.

P_1 is slender and evenly tapering, 9 mm. to 10 mm. long, composed of from twenty-six to thirty-one segments all of which are much broader than long. P_2 is similar, but very slightly stouter, of the same length or very slightly longer, composed of twenty-five segments of which the outermost are about as long as broad. P_3 is 11 mm. long, composed of twenty-two segments; in general it resembles P_2, but the segments in the distal half are about as long as broad. P_4 is 11 mm. long with twenty segments which become as long as broad on the fifth or sixth, and slightly longer than broad terminally. P_5 is 9 mm. long with fifteen segments, most of which are about as long as broad. P_8 is 8 mm. long with fourteen segments, and P_9 is 7 mm. long with thirteen segments. The distal pinnules are slender, 10 mm. long with twenty segments. On the genital pinnules the third-seventh segments are very slightly, almost imperceptibly, broadened.

The colour, in alcohol, is brownish white, the centrodorsal and division series brownish grey.

Another specimen, similar to the one just described but smaller (Cat. N° 35707 U. S. Nat. Mus.), was dredged by the "Albatross" off southern Luzon, Philippine Islands, in 243 Metres (Stat. 5110); it also has nineteen arms; the fourth-tenth segments of the genital pinnules are somewhat expanded, considerably more so than in the preceding.

Crinometra A. H. Clark.

At present this genus is in a most chaotic state. It includes the following nominal species:

POURTALÈS. Bull. Mus. Comp. Zoöl., vol. 1, 1868, N° 6, p. 111.

Comatula brevipinna

POURTALÈS. Bull. Mus. Comp. Zoöl., vol. 5, 1878, N° 9, p. 215.

Antedon granulifera

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 212 (in key).

Antedon pourtalesi

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 266, fig. 3.

Charitometra imbricata

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, pp. 644—648.

Crinometra pulchra
Crinometra margaritacea
Crinometra concinna
Crinometra insculpta
Crinometra gemmata

HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, pp. 287—308; 311—358.

Antedon brevipinna var. *decora*
Antedon brevipinna var. *gracilis* (preoccupied name)
Antedon brevipinna var. *pulchra* (preoccupied name)
Antedon brevipinna var. *elegans* (preoccupied name)
Antedon brevipinna var. *tuberosa* (preoccupied name)
Antedon brevipinna var. *diadema* (preoccupied name)
Antedon brevipinna var. *laevis* (preoccupied name)
Antedon brevipinna var. *spinosa* (preoccupied name)
Antedon brevipinna var. *coronata*
Antedon brevipinna var. *ornata*
Antedon brevipinna var. *granulosa*

In addition to these just given the species referred to by HARTLAUB as *Antedon angusticalyx* P. H. Carpenter, *Antedon granulifera* Pourtalès, and *Antedon pourtalesi* P. H. Carpenter, as well as *Antedon brevipinna* (Pourtalès), belong in this genus.

Chondrometra A. H. Clark.

Key to the Species of the Genus Chondrometra.

a[1] Centrodorsal very large, truncated conical or more or less columnar; cirrus sockets arranged in ten regular columns, two, more or less widely separated in the midradial line, in each radial area; cirri short, one sixth of the arm length, equal in length to the distance from the axillary to the twentieth brachial, XXX, 18—19, 35 mm. long; arms 210 mm. long (Timor and the Molluccas; 520—871 Metres) . . . . . *rugosa*

a² Centrodorsal small or of medium size, sharply conical, the cirrus sockets arranged in five more or less irregular columns one in the midline of each radial area; cirri long, from one fourth to one third of the arm length

b¹ size large; cirri numerous, with numerous segments, XX—XXV, 26—28, 55 mm. to 60 mm. more than one fourth of the arm length, equal to the distance from the axillary to the forty-sixth brachial; arms 211 mm. long (Timor to the Philippine Islands; 520—675 Metres) . . . . . *robusta*

b² size small; cirri less numerous with fewer segments, XV, 18, 27 mm. long, about one third of the arm length, equal to the distance from the axillary to the twentieth brachial; arms 75 mm. long (Meangis Islands; 900 Metres) *aculeata*

1. *Chondrometra rugosa* nov. sp.

Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres. 1 Ex.

Centrodorsal very large, truncated conical, almost columnar, 9 mm. broad at the base, 4.5 mm. across the slightly convex dorsal pole, and 7 mm. high interradially; the cirrus sockets are arranged in ten regular columns, two to each radial area; the columns in each radial area are almost or quite in contact which each other; the columns of adjacent radial areas are separated by a narrow and irregular bare area, which may show a slight narrow rounded ridge in its centre; there are three cirrus sockets to a column.

The cirri are XXX, 18—19, 35 mm. long, stout and short; the first segment is very short, the second is about twice as broad as long, and the following gradually increase in length so that the fifth is about as long as the median or distal diameter; the remaining segments are all about half again as long as the proximal diameter; the last five decrease rather rapidly in diameter so that the penultimate segment and the terminal claw are very small. After the first four segments the cirri become rather strongly compressed laterally; the ends of the segments are slightly swollen and prominent.

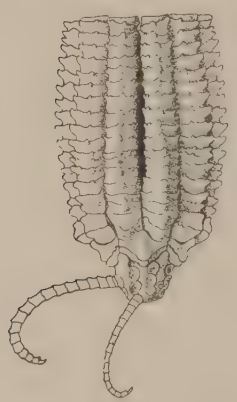


Fig. 8.

Lateral view of the proximal portion of a specimen of *Chondrometra rugosa*. Natural size. (Courtesy of the U. S. National Museum).

The ends of the basal rays are visible as small tubercles in the angles of the calyx; the radials are entirely concealed; the IBr_1 are almost concealed, but their distal portion, which is more or less irregular and tubercular, is visible as a narrow band just below the axillaries.

The proximal brachials have the same prominent median tubercles as those of *C. robusta*, but they are pointed instead of being rounded as in that species, and they lean somewhat anteriorly, so that they appear as broad stout overlapping spines. Instead of being perfectly smooth as in *C. robusta*, the distal borders of these earlier brachials are thickened and produced; these thickened and produced borders after the first six or seven brachials bear, beside the large broad median spine (of which the base runs backward along the whole median line of the dorsal surface of the segment) one or two smaller and more pointed spines between the median spine and the lateral edge which do not involve the dorsal surface of the segment.

The ten arms are about 210 mm. long; the diameter of the animal at the level of the seventh brachial is 22 mm., as against 19 mm. in *C. robusta*.

A specimen of this species in the collection of the United States National Museum was dredged at "Albatross" Stat. 5656, Gulf of Boni, in 871 Metres (Cat. N° 35702).

2. *Chondrometra robusta* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 558 (*Chlorometra robusta*).

Stat. 297. 10° 39 S., 123° 40′ E. Timor Sea. 520 Metres. 6 Ex.

One of the specimens, with arms about 170 mm. long, very closely resembles the type; it is very slightly smaller and more slender, and the median ornamentation of the arms is slightly less pronounced, though of exactly the same character.

Another is somewhat smaller than the preceding, with the dorsal ornamentation somewhat less marked; the cirrus sockets are arranged in a single regular column in the centre of each radial area, three, in one case four, to a column; the surface of the centrodorsal between the columns of cirrus sockets is bare and flat.

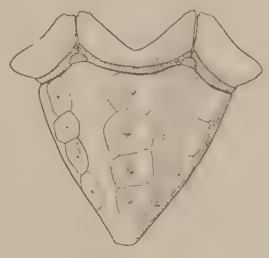


Fig. 9.

Lateral view of the centrodorsal of a specimen of *Chondrometra robusta*. (Courtesy of the U. S. National Museum).

A very small specimen has the arms 75 mm. long; the centrodorsal, which exactly resembles that in the preceding except that the interradial areas are slightly convex, appears unnaturally large; the radials are as large as the IBr_1; deep subradial clefts are present; the longest cirrus is 18 mm. long, composed of 17 segments the short apical cirri are 7 mm. long with 11 segments, of which the third corresponds to the fourth in the larger cirri; the longer segments are proportionately slightly longer than in the larger cirri, and there are only four short distal segments instead of eight or nine; the division series and arm bases are obscurely rounded carinate, resembling those of *C. aculeata* as figured by CARPENTER ("Challenger" Reports, Comatulae, pl. 23, fig. 3).

Another very small specimen has the arms 55 mm. long, and the longest cirri 12 mm. long, composed of 13 segments.

All of the specimens from this station have the median brachial ornamentation very slightly less accentuated than in the type. As in the type the centrodorsal is sharply conical, and the cirrus sockets are arranged in two closely crowded converging rows which are confined to the midradial region (Fig. 9).

Calyptometra A. H. Clark.

The only species in the genus *Calyptometra* is

1. *Calyptometra lateralis* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 226 (*Charitometra lateralis*).

Glyptometra A. H. Clark.

The only species in the genus *Glyptometra* is

1. *Glyptometra tuberosa* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 126, pl. 14, fig. 9; pl. 23, fig. 2 (*Antedon tuberosa*).
A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 557 (*Glyptometra tuberosa*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 49 (*Glyptometra tuberosa*).
[not *Glyptometra tuberosa* A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 407].

Chlorometra A. H. Clark.

The only species in the genus *Chlorometra* is

1. *Chlorometra garrettiana* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 142 (*Antedon garrettiana*).

Poecilometra A. H. Clark.

Key to the Species of the Genus Poecilometra.

a^1 Centrodorsal large and broad (in large specimens about 5 mm. in diameter at the base); the profile of the IBr series and arm bases makes only a very slight angle with the dorsoventral axis; the IBr series are usually (but not always) somewhat constricted so that the arm bases broaden rather suddenly above them; cirri XXV—XXX, 15—18; arms about 100 mm. long (northeastern end of Celebes and the Meangis Islands; 900—1327 Metres) . . . . . *acoela*

a^2 Centrodorsal smaller (4 mm. in diameter at the base) and lower; the profile of the IBr series and arm bases makes a considerable angle with the dorsoventral axis, and there is no constriction of the IBr series; cirri about XX, 20; arms 110 mm. long (southwestern Japan; 650 Metres). . . . . *scalaris*

1. *Poecilometra acoela* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 132, pl. 2, fig. 3; pl. 16 (*Antedon acoela*).
A. H. Clark. Smithsonian Miscellaneous Collections vol. 61, 1913, N° 15, p. 50 (*Poecilometra acoela*).

Stat. 122. 1° 58′.5 N., 125° 0′.5 E. Celebes Sea. 1165—1264 Metres. 7 Ex.
Stat. 124. 2° 27′ N., 125° 35′ E. Celebes Sea. 1327 Metres. 2 Ex.

These specimens do not seem to differ appreciably, in size or otherwise, from others at hand collected by the "Challenger".

In young individuals in which the radials are still about half as large as the IBr_1 (see the "Challenger" Report, pl. 16, fig. 5) there is but little trace of the dorsolateral processes characteristic of the adults; they are only slightly evident, though they can be made out as a thickened ridge in the place they will eventually occupy; at this stage also the genital pinnules are slender and evenly tapering, showing no trace of the lateral expansion of the segments which is so marked a feature in the fully grown.

As the radials become shorter the proximal border of the IBr_1 becomes produced so that it conceals the radials and proximal edge of the centrodorsal when the animal is viewed laterally. The dorsal surface of the radials is gradually resorbed as the proximal margin of the IBr_1 is produced, so that the rays and arms appear to be too large for the radials and centrodorsal, giving the appearance of having been glued upon them instead of having grown out from them.

In very large specimens the produced borders (proximal and lateral) of the IBr_1, which are typically smooth, become crenulate and scalloped.

The two examples from Stat. 124 resemble those from Stat. 122.

Charitometra A. H. Clark.

Key to the Species of the Genus Charitometra.

a^1 Brachials from the fourth onward with thickened, everted and tubercular distal borders, this character gradually dying away after the brachials become triangular; arms about 100 mm. long (Kermadec Islands; ? Fiji; 1134 and ? 2430 Metres) . . . . . *basicurva*

a^2 Brachials with unmodified distal borders, the arms appearing quite smooth; arms about 90 mm. long (Kermadec Islands to Fiji; 1134 Metres) . . . . *incisa*

Strotometra A. H. Clark.

Key to the Species of the Genus Strotometra.

a^1 Distal border of the second brachial everted, standing out at right angles to the dorsoventral axis of the arm as an enormous this rounded or fan-shaped crest, with a rounded or broadly scalloped edge, sometimes divided in the middle, which may reach 1.5 mm. in height, the height being three or four times the greater (outer) length of the ossicle; the fourth brachial (the epizygial of the first syzygial pair) has a similar crest nearly, if not quite, as large, the fith brachial has a crest about half as high, and more irregular; the sixth has a strongly produced and thickened distal edge, which is coarsely scalloped; the following brachials are of the normal type, with slightly produced and finely spinous distal borders (east of the northeastern end of Celebes; 1165—1264 Metres) . . . . . *ornatissimus*

a^2 None of the brachials have extravagantly everted distal borders

b^1 cirri relatively slender, with elongated segments of which al but the basal are twice as long as broad, and often longer (Kei Islands and Timor; 520—595 Metres). . . . . *priamus*

b^2 cirri stouter, few or none of the segments longer than broad

c^1 larger and stouter (arms from 65 mm. to 75 mm. long); proximal cirrus segments slightly longer than broad, distal slightly broader than long (Kei Islands and Timor; 252—520 Metres) . . . . . *parvipinna*

c^2 smaller and more delicate (arms 45 mm. long); al of the cirrus segments about as long as broad (southwestern Japan; 180—243 Metres) *hepburniana*

1. *Strotometra ornatissimus* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 82.

Stat. 122. 1°58′.5 N., 125°0′.5 E. Celebes Sea. 1165—1264 Metres. 1 Ex.

The centrodorsal is flattened hemispherical, 2.5. mm. in diameter at the base; the dorsal pole is slightly convex; the cirrus sockets are in one and a partial second marginal row.

The cirri are about XV (there are twenty-two cirrus sockets, but some are not full size); the longest cirrus stump is 4.5 mm. long to the distal dorsal edge of the fifth (the last remaining) segment; the first segment is about twice as broad as long, the second has the median length about equal to the median breadth, and is centrally constricted with the distal border produced, especially ventrally, where it overlaps the proximal end of the succeeding segment; the third is about twice as long as the proximal diameter, strongly constricted centrally with prominent distal ends like those of the second; the fourth is about three times as long as the median width, similar to the third; the fifth is similar to the fourth but not quite so constricted centrally and hence appearing slightly broader in lateral view.

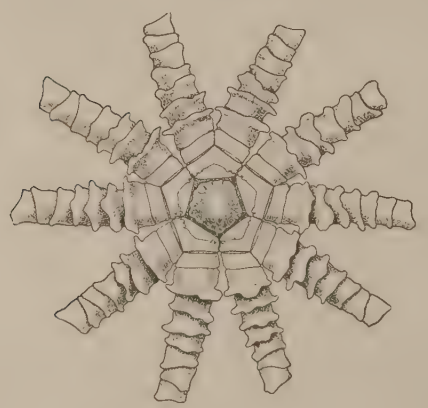


Fig. 10.
Dorsal view of the central portion of a specimen of *Strotometra ornatissimus* from Stat. 122. × 4. (Courtesy of the U. S. National Museum).

The radials are just visible over the edge of the centrodorsal.

The IBr_1 are short, about four times as broad as the median length, with the proximal border produced into a thin straight margin and the lateral borders slightly more produced, and turned outward.

The IBr_2 (axillaries) are broadly V-shaped (inverted), with the lateral edges, which are half again as long as those of the IBr_1, turned outward, unmodified, or with two or three broad scallops; the lateral thirds of the proximal border are produced and extended downward over the distal border of the IBr_1, and have a scalloped or tubercular border which is nearly parallel to the concave distal edge opposite; the distal edges of the axillaries are plain and unmodified.

The 10 arms are about 40 mm. long.

The first brachial has the proximal and distal edges parallel, the outer edge slightly produced and faintly scalloped, the inner edges in apposition, in their distal half everted and scalloped; a similar length of the inner portion of the distal edge is similarly everted and scalloped, and the inner distal angle is rounded and produced into a thin rounded process with more or less scalloped border; the proximal border, and the distal border other than the portion described, is unmodified.

The second brachial is about the length of the first, slightly wedge-shaped; the distal edge is everted and stands out at right angles to the axis of the arm in the form of an enormous thin rounded or fan-shaped crest with a rounded or broadly scalloped edge, sometimes divided in the middle, which may reach 1.5 mm. in height, or from three to four times the greater (outer) length of the ossicle; the proximal outer corner of the segment is slightly produced backwards over the distal outer corner of the first brachial, and is scalloped or slightly tuberculated; the produced inner distal angles of the first brachials reach as far as the base of the crest.

The third brachial (the hypozygal of the first syzygial pair) is oblong, very short, five or six times as broad as long, unmodified.

The fourth brachial (the epizygal of the first syzygial pair) is very short, oblong, little if any longer than the third (the hypozygal); the distal border is everted and produced into an enormous crest similar to, and nearly or quite as large as, that on the second brachial.

The fifth brachial is slightly wedge-shaped, with a crest about half as high as that on the preceding brachial and more irregular.

The sixth has a strongly produced and thickened distal edge which is coarsely scalloped.

Fig. 11.

Lateral view of the proximal portion of a specimen of *Strotometra ornatissimus* from Stat. 122. × 4. (Courtesy of the U. S. National Museum).

The seventh is slightly wedge-shaped, from two to two and one half times as broad as long, with the distal edge slightly produced in the direction of the axis of the arm and finely spinous.

After the tenth or twelfth the brachials become triangular, about as long as broad, and after four or five more very obliquely wedge-shaped and longer than broad, and distally longer and less obliquely wedge-shaped. Beyond the sixth the brachials are almost smooth, with only slightly produced and finely spinous distal edges.

P_1 is about 4.5 mm. long with about thirteen segments of which the first two are broader than long with rounded dorsal processes, the third is slightly longer, the fourth is about as long as broad, and those beyond the seventh are slightly longer than broad. P_2 is about 4 mm. long, similar to P_1, composed of twelve segments of which the outer are slightly longer than those of P_1. The genital pinnules are about 4 mm. long, with the fourth, fifth and sixth segments enormously expanded, roofing over the gonads which are also protected ventrally by strong calcareous plates of irregular shape; the seventh and following segments are small and slender.

On one arm P_1 and P_2, as well as the pinnules following, bear gonads, a condition never before observed.

2. *Strotometra parvipinna* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 127, pl. 15, fig. 9 (*Antedon parvipinna*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 50 (*Strotometra parvipinna*).

Stat. 254. 5° 40′ S., 132° 26′ E. Arafura Sea. 310 Metres. 1 Ex.
Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres. 6 Ex.

The largest specimen from Stat. 297 has the arms 75 mm. long, and is relatively large and stout; the surface of the dorsal pole of the centrodorsal and of the radials and IBr_1 is very thickly covered with irregular tubercles, so that it appears more or less sponge-like; the borders of the ossicles of the IBr series and of the first two brachials are thickened and slightly everted; the IBr_2 (axillary) has a rather high median keel; the following ossicles have a prominent rounded median tubercle which becomes a low broad carinate process on the triangular brachials; the cirri are XVI, 12—13; the longest proximal segments (the third and fourth) are slightly longer than broad; the distal segments are slightly broader than long; P_1 has 17—19 segments.

Another, similar to the preceding but with the arms only 60 mm. long, has the modification of the surface of the radials and IBr_1 not so strongly marked; the cirri are X, 12.

A third is similar to the last, but the modification of the surface of the radials is scarcely noticeable; the cirri are X, 11—12; all of the others but one resemble this.

A very interesting individual with the arms 65 mm. long has the IBr_1 with a high rounded median keel, and everted lateral borders; on either side of the median keel there are from two to five high rounded tubercles; the type of ornamentation as a whole strongly suggests the condition found in *Glyptometra tuberosa*; the IBr axillary has the borders slightly everted, and the distal borders margined with confluent tubercles which rapidly diminish in width from the median line to the outer angles.

3. *Strotometra hepburniana* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 139 (*Antedon hepburniana*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 187 (*Strotometra hepburniana*).

4. *Strotometra priamus* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 25, 1912, p. 81.

Stat. 266. 5° 56′.5 S., 132° 47′.7 E. Arafura Sea. 595 Metres. 39 Ex.
Stat. 297. 10° 39′ S., 123° 40′ E. Timor Sea. 520 Metres.

The centrodorsal is very low, low hemispherical or almost discoidal, from 1.5 mm. to

2 mm. in diameter; the cirrus sockets are arranged in one and a partial second irregular closely crowded row.

The cirri are XVII, 11—12 (usually 11), 8 mm. to 11 mm. long, slender, with elongated segments; the first segment is very short, dorsally expanded into a rounded knob-like process; the second is not quite so long as broad; the third is twice as long as the median diameter; the fourth and fifth are nearly three times as long as the median diameter; the remainder are very slightly shorter, becoming a trifle longer again, about two and one half times as long as broad, on the antepenultimate and penultimate; the penultimate segment is of lesser diameter, in lateral view, than those preceding; the third and following are moderately constricted centrally with prominent distal ends, this feature decreasing distally; the segments carry no dorsal spines or other processes; the opposing spine is prominent, terminal, directed obliquely forward, its proximal profile convex, its distal concave, its base occupying only slightly more than one third of the dorsal surface of the penultimate segment; the terminal claw is about as long as the penultimate segment, moderately stout, and moderately and evenly curved.

The ends of the basal rays are small but prominent tubercles in the angles of the calix.

The radials are entirely concealed by the centrodorsal.

The IBr_1 are short, about four times as broad as long in the median line; the proximal border is slightly produced, slightly convex but usually becoming straight in the lateral quarters; the lateral edges are in close apposition with those of their neighbors, and are widely divergent, and produced and everted as in *Calyptometra lateralis*; the distal edge is sometimes obscurely scalloped in the lateral thirds, the median third being slightly excavated for the reception of a rounded posterior process from the axillary.

The IBr_2 (axillaries) are exceedingly short, about two and one half times as broad as long; their lateral edges resemble those of the IBr_1, but are only about half as long.

The 10 arms are 40 mm. long. The first brachials are in close apposition both internally and externally with their neighbors; their proximal and distal borders are parallel; their proximal borders are slightly everted; their outer borders are produced and everted like the outer borders of the preceding ossicles; the inner borders are similarly everted, but not so much so; the synarthrial tubercles, though small and well rounded, are rather prominent. The second brachials are similar to the first, but about twice as long externally as internally. The first syzygial pair (composed of the third and fourth brachials) is roughly oblong, about two and one half times as broad as long, with the lateral edges modified as in the preceding; the next three brachials are wedge-shaped, about twice as broad as the maximum length, the dorsal surface usually concave and the distal edge therefore prominent; after the tenth the brachials become triangular, about as long as broad, later very obliquely wedge-shaped, and toward the ends of the arms twice as long as broad. Beyond the second syzygy the brachials have slightly produced and very finely spinous distal ends.

P_1 is very slender and delicate, 6 mm. long with 35 segments of which the seventh or eighth and following are about as long as broad; except for the absence of the expansion of the first two segments it resembles P_1 in *Calometra*. P_2 is 6 mm. long with 18 segments of which the sixth-eleventh are greatly produced ventrally, forming a roof over the genital glands,

which are also further protected by a heavy ventral plating; the terminal seven segments are very small and delicate. P_3 is similar, 4.5 mm. long with 14 segments of with the sixth-tenth are expanded to protect the gonads. P_4 is 4 mm. long with 13 segments of which the fifth-ninth are expanded. P_5 is 3 mm. long with 10 segments, none of which are expanded; the pinnule is small and moderately stout. The following pinnules gradually increase in length, the distal pinnules being 5 mm. long with 11 or 12 segments.

2nd Suborder MACROPHREATA.

I. Family Antedonidae Norman (emended).

Key to the Subfamilies of the Family Antedonidae.

a¹ Cirrus sockets arranged in definite columns on a conical or columnar, usually large, centrodorsal . . . . . Zenometrinae

a² Cirrus sockets arranged in transverse alternating rows, or irregularly, on a hemispherical to discoidal or conical centrodorsal

b¹ the segments of the genital pinnules are much expanded, forming a roof over the gonads . . . . . Isometrinae

b² the segments of the genital pinnules are not expanded

c¹ P_1 is composed of numerous (usually more than 50 and never less than 30) short segments of which at least the first six or seven, and usually nearly all, are broader than long, and the distal are rarely more than twice as long as broad; P_1 is about as long as, or longer than, P_2

d¹ one or more of the following pinnules resembles P_1 . . Heliometrinae

d² P_2 and the following pinnules are composed of segments which, beyond the third or fourth, are much elongated. . Thysanometrinae

c² P_1 is composed for the most part of much elongated segments, though a few of the basal segments may be short; the distal segments are at least twice as long as broad

d¹ the distal cirrus segments are entirely without dorsal processes on their distal ends; the cirri are usually (but not always) short, rarely with more than 20, never with more than 30, segments . . . . . Antedoninae

d² the distal cirrus segments always have the distal dorsal edge prominent, with the median portion more or less produced in the form of a dorsal spine, and the middorsal line more or less strongly carinate

e¹ P_2 resembles P_1, and always differs from the genital pinnules; P_a is freguently, and P_1 occasionally, absent . Perometrinae

e² P_2 resembles P_3 and the succeeding pinnules, and often bears a more or less developed gonad; all of the lower pinnules are invariably present . . . . . Bathymetrinae

1st Subfamily Antedoninae A. H. Clark.

Key to the Genera of the Subfamily Antedoninae.

a¹ P_2 of the same length and character as P_3 and the following pinnules, and much shorter than (usually about half as long as) P_1

b¹ pinnule segments with unmodified, or at the most very finely spinous, distal edges; size medium, the arms rarely under 45 mm. in length (Norway to the Gulf of Guinea, including the entire Mediterranean basin and the east Atlantic islands; Caribbean Sea to Rio de Janeiro, Brazil; 0—445 Metres) . . . . . **Antedon**

b² pinnule segments with strongly produced, everted and coarsely spinous distal edges; size small, the arms never over 70 mm. and rarely over 45 mm. in length (southern coasts of Australia northward throughout the East Indian region to southern Japan; 0—275 Metres). . . . . **Compsometra**

a² P_2 not of the same length and character as P_3 and the following pinnules, and never only half as long as P_1

b¹ P_3 of the same length and character as the following pinnules; P_2 much longer than P_3, resembling P_1, which is still longer

c¹ P_1 longer than the cirri, becoming very slender and flagellate distally, composed of about 40 segments (Ceylon to the Society Islands; 0—47 Metres) . . . . . **Mastigometra**

c² P_1 shorter than the cirri, less slender and more or less stiffened, composed of 18—21 segments (Moluccas to China, end eastward to the Society Islands; 0—397 Metres). . . . . **Euantedon**

b² P_3 not of the same length and character as the following pinnules

c¹ P_3 much the longest and stoutest pinnule on the arm

d¹ the distal ends of the cirrus segments do not overlap the bases of those succeeding; the dorsal edge of the outer four to six cirrus segments is about as long as the proximal border; the brachials have strongly produced and coarsely spinous distal edges (Flores to Borneo and the Philippine Islands; 0—502 Metres) . **Toxometra**

d² the cirrus segments have produced distal ends which overlap the proximal ends of those succeeding; the outer cirrus segments are much longer than their proximal width; the branchials have smooth, or only very finely spinous, distal edges

e¹ smaller, with not over 16 cirrus segments; cirri less numerous,

XX—XLV (rarely over XL); arms 23 mm. to 50 mm. long (from the Red Sea to Madagascar and Mauritius, eastward to northern Australia and the East Indies, and northward to southern Japan; 0—106 Metres) . **Dorometra**

e^2 larger, with 16—33 cirrus segments; cirri more numerous, XXXV—LX (rarely less than XL); arms 75 mm. to 80 mm. long (Lesser Sunda Islands to the Philippines; 69—140 Metres). . . . . **Eumetra**

c^2 P_3 not much the longest and stoutest pinnule on the arm

d^1 P_1, P_2 and P_3 similar and of approximately equal length, with at least 13 segments

e^1 P_1, P_2 and P_3 longer than the genital pinnules; the pinnules are not especially stiffened, and their component segments do not bear prominent spines on the distal edges; the centrodorsal is low hemispherical (Philippine Islands to southern Japan; 23—192 [?250] Metres) . . . . . **Iridometra**

e^2 P_1, P_2 and P_3 shorter than the genital pinnules; all the pinnules slender and stiff, especially the lower which are thorn-like, with long spines on the distal edges of the segments; the centrodorsal is large, rounded conical (coast of Brazil; 41 Metres) **Hybometra**

d^2 P_2 much longer than P_1, and longer than P_3, though similar to the latter; centrodorsal more or less sharply conical (Andaman Islands to southern Japan; 54—201 [?250] Metres) . . **Andrometra**

Mastigometra A. H. Clark.

Key to the Species of the Genus Mastigometra.

a^1 Distal cirrus segments from one third to one half again as long as broad; arms from 105 mm. to 120 mm. long; cirri XXXV—LXXX, 12—16, 12 mm. to 14 mm. long

b^1 P_1 25 mm. long with 40 segments; P_2 16 mm. long with 35 segments; P_3 10 mm. to 12 mm. long with 25 segments (locality unknown). . *flagellifera*

b^2 P_1 15 mm. long with 30 segments; P_2 10 mm. long with 24 segments; P_3 7 mm. long with 13—15 segments (Tahiti; littoral) . . . . . *pacifica*

a^2 6th and following cirrus segments about as long as broad; cirri L—XC, 16, about 10 mm. long; arms probably about 80 mm. long (Ceylon; 0—47 Metres) . . . . . *micropoda*

1. *Mastigometra flagellifera* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 21, 1908, p. 229 (*Mastigometra flagellifera*).

2. *Mastigometra pacifica* nov. sp.

The centrodorsal is very flat, almost discoidal, with a large flat dorsal pole 2 mm. in diameter; the cirrus sockets are arranged in two and a partial third alternating marginal rows.

The cirri are about XXXV, 12—16 (the longest usually 14—16), 12 mm. to 14 mm. long, in general appearance strongly suggesting those of *Antedon petasus*; the first segment is very short, the second about twice as broad as long, the third nearly as long as broad, the fourth slightly longer than broad, the fifth the longest, from one third to one half again as long as the median diameter, the following of about the same proportions; from the fourth or fifth segment onward the cirrus in lateral view increases slowly in diameter so that the outer portion, which is rather strongly recurved, is nearly twice as broad as the proximal; the opposing spine is minute; the terminal claw is nearly as long as the penultimate segment, stout and strongly curved. The earlier cirrus segments have a slight central constriction; the outer in lateral view have a quite straight dorsal, and a nearly straight ventral, profile.

The distal border of the radials is even with the rim of the centrodorsal.

The IBr_1 are very short, from five to six times as broad as long, with the distal and proximal edges parallel and the lateral edges slightly convergent, making an angle of about 90° with those of the adjacent IBr_1, the perisomic area thus exposed being entirely covered by a conspicuous group of perisomic interradials.

The IBr_2 (axillaries) are triangular, half again as broad as long, with the anterior angle somewhat produced.

The brachials resemble those of the other species of the genus; the distal edges are slightly produced and finely spinous.

Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of three oblique muscular articulations.

The arms are 105 mm. long, becoming extremely slender and attenuate distally.

P_1 is 15 mm. long, composed of 30 segments of which the first is broader than long, the second half again as long as broad, and the third and following are twice as long as broad, becoming longer in the distal half; from about the fifth onward the segments have overlapping and prominently spinous distal ends. The pinnule is considerably stouter basally than P_2 and the succeeding pinnules, but becomes exceedingly attenuated and flexible in the distal half.

P_2 is 10 mm. long with 24 segments, more slender than P_1 with relatively longer segments which have more prominently spinous distal ends.

P_3 is 7 mm. long with 13—15 segments, tapering more gradually than P_2 and hence appearing stouter, and without the long flagellate tip.

P_4 apparently resembles P_3, but is somewhat shorter.

This species is described from two specimens from Tahiti, Society Islands, in the Zoological Museum (Staatssammlung) at Munich; they were part of the lot including the specimens upon which *Euantedon tahitiensis* is based.

3. *Mastigometra micropoda* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 649 (*Mastigometra micropoda*. —— Crinoids of the Indian Ocean, 1912, p. 227, fig. 42, p. 228 (*Mastigometra micropoda*).

Euantedon A. H. Clark.

Key to the Species of the Genus Euantedon.

a^1 More than 20 cirrus segments; cirri XL, 22—25, 15 mm. to 20 mm. long; P_1 7.5 mm. long with 10 + segments; P_2 6 mm. long with 10 segments; P_3 4.5 mm. long with 11 segments; arms 100 mm. long (Tahiti; littoral) . . *tahitiensis*

a^2 Less than 20 (15—17) cirrus segments

b^1 longest cirrus segments about four times as long as the median diameter; after the eighth the cirrus segments decrease in length so that the antepenultimate is little, if any, longer than broad; the cirrus segments have a straight dorsal and ventral profile, and the ends are not swollen (Moluccas; 397 Metres). . . . . *moluccana*

b^2 longest cirrus segments from two to two and one half times as long as broad; the proximal and distal cirrus segments are subequal in length; both the proximal and distal ends of the segments are thickened and prominent (?coast of China; ?littoral) . . . . . *sinensis*

1. *Euantedon tahitiensis* nov. sp.

The centrodorsal is very low, with a relatively large slightly convex dorsal pole 1.5 mm. in diameter; the cirrus sockets are arranged in about three closely crowded more or less irregular alternating rows.

The cirri are XL, 22—25, 15 mm. to 20 mm. long; the first segment is very short, the second about twice as broad as long, the third about as long as broad, the fourth not quite twice as long as the median diameter, the fifth slightly longer, the sixth and seventh the longest, between two and two and one half times as long as the median diameter; the following very slowly decrease in length, the fourteenth or fifteenth and those succeeding being usually from one third to one half again as long as the median diameter, though sometimes only slightly longer than broad; the segment preceding the antepenultimate and the antepenultimate itself are longer again, about twice as long as broad; on the segments as far as the eighth both the dorsal and ventral profiles are equally concave, so that the articulations are prominent; from this point onward the dorsal profile becomes progressively more and more concave, and the ventral less and less, so that the segments beyond the twelfth or thirteenth have the ventral profile approximately straight, and the dorsal very strongly and narrowly concave so that both ends of the segments on the dorsal side appear very prominent; the opposing spine is very small, terminal or subterminal, directed obliquely forward; the terminal claw is slightly shorter than the penultimate segment, moderately curved.

The distal border of the radials projects slightly beyond the rim of the centrodorsal.

When viewed at right angles to the plane of their dorsal surface the IBr_1 appear oblong, about four times as broad as long; when viewed at right angles to the dorsoventral axis of the animal the median length appears to be about one third less than the lateral.

The IBr_2 (axillaries) are rhombic, half again as broad as long, the anterior angle sharp, the posterior process very broad and obtuse; the anterior borders are moderately concave; the proximal are straight except just before they reach the lateral border where they turn to a horizontal direction and then curve slightly dornward, fitting snugly around the rounded distal angles of the IBr_1.

The elements of the IBr series and the first two brachials are in very close lateral apposition and are more or less sharply flattened against their neighbors.

The arms are 100 mm. long. The first brachials are wedge-shaped, three times as long exteriorly as interiorly, the inner borders in close contact. The second brachials are of nearly the same size and shape, slightly larger and more irregular. The first syzygial pair (composed of the third and fourth brachials) is slightly longer interiorly than exteriorly, twice as broad as long. The following brachials as far as the second syzygy are irregularly wedge-shaped, about three times as broad as long, those beyond the second syzygy triangular, somewhat broader than long, soon becoming wedge-shaped, slightly broader than long, and distally wedge-shaped, about as long as broad, and terminally longer than broad.

Syzygies occur between the third and fourth, ninth and tenth and fourteenth and fifteenth brachials, and distally at intervals of three oblique muscular articulations.

P_1 7.5 mm. long, composed of 19 + segments of which the first is twice as broad as long, the second is slightly longer than broad, the third is half again as long as broad, and the following are twice as long as broad, becoming three times as long as broad distally; the third and following have rather prominent distal eads which are armed with fine spines, at first only on the distal border (away from the ventral surface), later all around. The pinnule is markedly stouter than those succeeding, and somewhat stiffened.

P_2 is 6 mm. long with 10 segments, resembling P_1 but more slender with proportionately longer segments distally.

P_3 is 4.5 mm. long with 11 segments, smaller, more delicate, and less stiffened than P_2.

The distal pinnules are from 8 mm. to 9 mm. long, very delicate, composed of 20—21 segments.

This species is described from two specimens from Tahiti, Society Islands, in the Zoölogical Museum (Staatssammlung) at Munich.

2. *Euantedon moluccana* (A. H. Clark).

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 129 (*Antedon moluccana*).

Stat. 139. 0° 11′ S., 127° 25′ E. Molucca Passage. 397 Metres. 1 Ex.

The centrodorsal is low hemispherical, the bare dorsal pole 1.5 mm. in diameter, very slightly convex, with an obscure broad median tubercle surrounded by obsolete cirrus sockets.

The cirri are about XXX, 15—17 (usually 17), slender and delicate, the longest about

18 mm. long; the first segment is very short, the second from one half again to twice as long as the median diameter, the third from two and one half to three times as long as the median diameter, the fourth and following about four times as long as the median diameter; after the eighth the segments slowly become shorter so that the antepenultimate is little, if any, longer than broad; the penultimate segment is small, wedge-shaped, about half the size of the antepenultimate; the opposing spine is small, subterminal; the longer earlier segments are moderately constricted centrally, with expanded and slightly overlapping ends; the shorter terminal have straighter dorsal and ventral profiles so that in lateral view the cirri appear to broaden just at the tip; there may be a slightly marked transition segment at about the eighth.

The distal border of the radials is even with the rim of the centrodorsal.

The IBr_1 are very short, about four times as broad as the lateral length, which is about twice the median length; the lateral edges are concave; they are just in apposition basally, but diverge from each other in the angles of the calyx at an obtuse angle of about 120°.

The IBr_2 (axillaries) are slightly broader than long, very widely separated; the lateral edges are about as long as those of the IBr_1, concave, diverging outward at approximately a right angle to each other; the anterior sides are approximately at right angles to each other, nearly straight; the anterior angle is only very slightly and broadly produced; a rounded median posterior projection incises the IBr_1.

The arms are all broken; the size appears to be about that of an average *Antedon mediterranea*.

The first brachial is very short, twice as long exteriorly as interiorly, the median length about the same as the internal; the proximal third of the inner borders are united, but the distal two thirds diverge almost in a straight line.

The second brachial is much larger, irregularly quadrate.

The structure of the arms is essentially the same as that of *Antedon mediterranea*.

P_1 is from 13.5 mm. to 16 mm. long, composed of 18—21 segments, moderately slender and tapering evenly from the base to the delicate tip; the first segment is not quite so long as broad, the second decreases slightly in diameter distally and is about as long as the proximal diameter, the third is between two and one half and three times as long as broad, and the following are somewhat over three times as long as broad, becoming more elongate distally; the segments have the whole surface very finely spinous, and the outer have very finely spinous distal ends; the articulations are very slightly swollen.

P_a is similar to P_1, but is not quite so long.

P_2 is 7 mm. long with 14—15 segments, much more slender than P_1 but otherwise similar.

P_3 is 5 mm. long with 11 segments, slender and weak, all but the two basal segments much elongated.

P_4 is 5 mm. long with 10 segments, slender and weak, similar to P_3 but more slender beyond the third segment.

P_5 is 6 mm. long with 13 segments, slightly stouter than P_4 with slightly shorter segments.

P_6 is 7.5 mm. long with 14 segments, similar to P_5, but the component segments are slightly shorter with more expanded ends.

3. *Euantedon sinensis* A. H. Clark.

A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 31 (*Euantedon sinensis*).

Antedon de Fréminville.

Key to the Species of the Genus Antedon.

a¹ 18 or more cirrus segments, all of which are long, the distal differing but slightly from the proximal; the distal portion of the cirri is not compressed laterally so that the cirri appear of the came diameter throughout; no perisomic interradials in the angles of the calyx; arms slender and very long, the proximal triangular brachials being considerably longer than broad. IBr_1 long, not more than three times as broad as long, regularly oblong or slightly trapezoidal, the lateral edges making usually a straight line, more rarely a broadly obtuse angle, with those of the IBr_2 (axillary)

b¹ usually 18—20 cirrus segments (from Málaga northeastward along the coasts of Spain and France to Italy, thence southward to Sicily; Aegean Sea). . . . . *mediterranea*

b² usually 24—28 cirrus segments (Adriatic Sea). . . . . *adriatica*

a² 17 or fewer cirrus segments (more than 15 only in exceptional cases) of which the proximal are long, but the distal, which are more or less compressed laterally, are shorter, usually about as long dorsally as broad, and broader, usually twice as broad, in lateral view; interprimibrachial plates usually prominently developed in the angles of the calyx; arms comparatively short and stout, the proximal triangular brachials being usually noticeably broader than long, never longer than broad; IBr_1 short, the length rarely so much as one third of the width, much narrower distally than proximally, so that the lateral angles of the axillaries project beyond the distal angles of the IBr_1

b¹ cirri increasing in lateral diameter very gradually, the distal portion being not greatly different from the proximal; shortest outer cirrus segments measuring along their dorsal profile one third to one half more than their lateral diameter

c¹ P_1 with more than 25 segments (coasts of Ireland, southern Scotland and England [except the North Sea], the Channel Islands, and southward to Cezimbra, Portugal). . . . *bifida*

c² P_1 with less than 20 segments (Gulf of Guinea, from Wapoo, Ivory Coast, eastward to Ilha das Rolas, off the southern coast of São Thomé) . . . . . *hupferi*

b² outer cirrus segments strongly compressed laterally, so that the cirri are in lateral view nearly or quite twice as broad distally as proximally; longer proximal segments half again to twice as long as the median diameter; shorter distal segments as long dorsally as broad proximally

c^1 size large; cirri usually more than XL; interradial perisomic plates usually inconspicuous or undeveloped (Faroë and Shetland Islands, Norway, western Sweden and Denmark, and northern Scotland, extending southward in deep water to the southern coasts of England and Ireland; absent from the North Sea). . . . . *petasus*

c^2 size small; arms less than 60 mm. in length; cirri less than XXXV

d^1 centrodorsal very low, evenly convex, with very sloping sides; dorsal pole very small, from one third to one half of the diameter of the centrodorsal; arms 30 mm. to 40 mm. long (St. Thomas, Danish West Indies, southward to Rio de Janeiro, Brazil) . *dübenii*

d^2 centrodorsal thin discoidal, the large flat dorsal pole being in width more than two thirds of the basal diameter of the centrodorsal; arms usually about 60 mm. long (from Corsica and Sicily westward along the northern coast of Africa to Tangier, and southward to Sénégal, including the Azores, Madeira, and the Canary Islands). . . . . *moroccana*

Compsometra A. H. Clark.

Key to the Species of the Genus Compsometra.

a^1 Cirri about one third of the arm length, exceedingly slender and delicate, almost hair-like, very slightly recurved, the earlier segments with greatly swollen articulations, those in the distal fourth gradually decreasing in diameter so that the cirrus ends in a sharp point; no opposing spine; arms 20 mm. to 40 mm. long; cirri X—XVII, 12—16, 7 mm. to 11 mm. long; P_1 3.5 mm. to 4 mm. long with 9—11 segments; P_2 1.5 mm. long to 1.7 mm. long with 7 segments (Flores to the Moluccas; 0—95 Metres). . . . . *longicirra*

a^2 Cirri short, not over one fifth of the arm length and usually less, stouter, in lateral view increasing in diameter in the distal half, with the outer segments much shorter than the elongate earlier segments, never more than twice as long as broad and usually much shorter; an opposing spine is always present

b^1 cirri short, about one ninth of the arm length, composed of short segments of which the longest proximal (the fourth and fifth) are about half again as long as the median diameter and the last three preceding the penultimate are about as long as broad, or even broader than long; in the outer half the cirri are strongly recurved and the segments are strongly constricted laterally so that in lateral view this part of the cirri appears about twice as broad as the proximal; centrodorsal discoidal with a very broad bare dorsal pole nearly or quite 2 mm. in diameter; cirri XXXIV—XXXVI, 9—12, (usually 10), 7 mm. long; arms 60 mm. to 65 mm. long (from Port Jackson,

New South Wales, southward and westward to Koombana Bay, southwestern Australia; 0—18 Metres) . . . . . *incommoda*

b^2 cirri longer, from one seventh to one fourth of the arm length, with longer segments of which the longest proximal are at least twice as long as the median diameter and the two preceding the antepenultimate are markedly longer than broad, and often elongated; centrodorsal low hemispherical or low conical, never discoidal, always with strongly sloping sides and a moderate to very small dorsal pole

c^1 cirrus segment preceding the antepenultimate three times as long as the median diameter, or longer; cirri slender and delicate, almost as delicate as those of *longicirra*, with not more than 10 segments of which the proximal are about three times as long as the diameter of the much swollen ends, and the antepenultimate is about twice as long as broad; all the cirrus segments have greatly expanded distal ends, this becoming less marked distally; arms 15 mm. to 35 mm. (rarely more than 20 mm.) long; cirri with 8—10 (usually 8—9) segments, 4.0 mm. to 4.5 mm. long; P_1 with 10—12 segments; P_2 about half as long, with 7 segments (Timor and Flores to the Moluccas, Celebes and the Sulu Archipelago; 0—275 [?400] Metres). . . . . *parviflora*

c^2 cirrus segment preceding the antepenultimate not more than twice as long as the median diameter, and often much shorter, cirri less slender, with not less than 10 segments of which the outer have the distal ends slightly, or not at all, expanded

d^1 cirri rather stout and very strongly recurved in the outer three fourths; antepenultimate cirrus segment as long as, or very slightly longer than, broad; P_1 8.5 mm. long with 17—18 segments; P_2 4.0 mm. long with 11 segments; arms 45 mm. long cirri XXX, 10—12, 8 mm. to 9 mm. long (Moluccas; 45 Metres) . . . . . *iris*

d^2 cirri more slender, and less strongly recurved in the outer portion; antepenultimate segment markedly longer than broad, usually about twice as long as broad; P_1 with not more than 15 segments; arms 30 mm. to 70 mm. (usually 30 mm. to 45 mm.) long; cirri XV—XXX, 12—14, 7 mm. to 8 mm. long

e^1 pinnule segments with extravagantly developed everted and spinous distal edges (Tokyo Bay, Japan, and southward to Formosa; 14—63 Metres) . . . . . *serrata*

e^2 pinnule segments with moderately everted and spinous distal edges (southern Australia, and northward to the Dampier Archipelago on the west and Flinders Island [14° 10′ S.] on the east; 0—9 Metres) . . . . . *lovéni*

1. *Compsometra longicirra* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 134 (*Compsometra longicirra*); p. 135 (*Compsometra gracilipes*).

Stat. 50. Bay of Badjo, western coast of Flores. Reef. 14 Ex.
Stat. 167. 2° 35'.5 S., 131° 26'.2 E. Ceram Sea. 95 Metres. 6 Ex.

The centrodorsal is flattened hemispherical, the dorsal pole more or less thickly covered with rounded tubercles, which become smaller centrally; the cirrus sockets are arranged in one or two irregular crowded rows.

The cirri are X—XX, 12—16, 7 mm. to 11 mm. long, extremely slender, very slightly curved, tapering gradually to a sharp point in the distal fourth, composed of extremely long segments with greatly swollen articulations, especially in the proximal portion; the first segment is very short, the second nearly as long as broad, the third from two and one half to three times as long as the diameter of the expanded distal end, and the following about four times as long as the diameter of the greatly expanded distal ends, which are about twice as broad in lateral view as the central portion of the segments; beyond the fifth-eight the expansion of the distal ends of the segments gradually decreases, and the lateral diameter of the segments after the tenth gradually decreases to the sharp tip; there is no opposing spine; the terminal claw is very slender, and straight.

The distal edge of the radials is even with the rim of the centrodorsal, and sometimes bears a few tubercles toward the interradial angles of the calyx; the distal interradial angles are slightly separated.

The IBr_1 are very short, about four times as broad as long, twice as long laterally as in the median line; the lateral edges are parallel, or converge slightly; they make an angle of about 90° with the lateral edges of the adjacent IBr_1, and are not in contact basally; the proximal and distal edges are broadly thickened, the proximal more broadly than the distal, and very finely spinous; as a result of this thickening of the proximal and distal edges the lateral borders have a rounded notch.

The IBr_2 (axillaries) are rhombic, all the sides moderately concave, with truncated lateral angles, from half again to twice as broad as long; the lateral angles are slightly produced outward and downward in rounded lateroposterior processes; the truncated ends of the lateral angles are about as long as the median length of the IBr_1; all the borders are slightly everted and very finely spinous.

The 10 arms are from 20 mm. to 40 mm. long, and exceedingly slender; the brachials are elongate, slightly constricted centrally, this condition increasing distally, and practically smooth, with no production of the distal edges. Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of three oblique muscular articulations.

P_1 is from 3.5 mm. to 4 mm. long, and tapers evenly from the base to the tip; it is composed of 9—11 segments of which the first is twice as broad as long, the second half again as long as broad, the third twice as long as broad, and the remainder from two and

one half to three times as long as broad; the third and following have produced overlapping spinous distal edges which are most developed along the distal side. P_2 is from 1.5 mm. to 1.7 mm. long, much smaller and more slender than P_1 though with similar segments, of which the first is short, the second slightly longer than broad, the third twice as long as broad, and the remainder elongated. P_3 is similar to P_2 but very slightly smaller, with only a very slight production of the distal dorsal edges of the segments. The distal pinnules are from 2 mm. to 4 mm. long, and extremely slender.

2. *Compsometra parviflora* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 133 (*Compsometra parviflora*).

Stat. 50. Bay of Badjo, western coast of Flores. Reef. 42 Ex.
Stat. 65a. 7° 0′ S., 120° 34′.5 E. South off Saleyer. 120—400 Metres. 3 Ex.
Stat. 99. 6° 7′.5 N., 120 26′ E. Anchorage off North Ubian. 16—23 Metres. 1 Ex.
Stat. 105. 6° 8′ N., 121° 19′ E. Sulu Archipelago. 275 Metres. 1 Ex.
Stat. 125. Anchorage off Sawan, Siau Island. 27 Metres. 2 Ex.
Stat. 240. Banda. 9—36 Metres. 1 Ex.
Stat. 289. 9° 0′.3 S., 126° 24′.5 E. Timor Sea. 112 Metres. 1 Ex.

The centrodorsal is flattened hemispherical, very low, bearing two irregular rows of cirrus sockets.

The cirri are XV—XXV, 8—9 (usually 8), 4 mm. long, exceedingly slender, the much elongated segments with greatly expanded ends; the first segment is about twice as broad as long, the second from two to two and one half times as long as the diameter of the expanded distal end, the third and fourth the longest, about three times as long as the diameter of the expanded distal ends; the following decrease slowly in length so that the antepenultimate is about twice as long as the diameter of its expanded distal end, and the penultimate is from one third to one half again as long as broad; the strong constriction of the middle of the segments decreases in amount distally; the opposing spine is terminal, prominent, in height reaching nearly half the distal diameter of the penultimate segment; the terminal claw is about as long as the penultimate segment, rather stout, strongly and evenly curved.

The distal borders of the radials are even with the rim of the centrodorsal; their distal angles are slightly separated.

The IBr_1 are about three times as broad as the lateral length, which is twice the median length; the lateral edges converge slightly, and are widely separated from those of their neighbors; the lateral portion of the proximal and distal edges is sometimes slightly thickened.

The IBr_2 (axillaries) are rhombic with the lateral angles truncated, twice as broad as long, widely separated from their neighbors.

The 10 arms are from 15 mm. to 20 mm. long, and slender; the brachials have somewhat prominent very finely spinous distal ends; syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of three oblique muscular articulations.

P_1 is from 2.3 mm. to 3.5 mm. long with 9—10 segments of which the first is twice a

broad as long, the second somewhat longer than broad, the third two and one half times as long as the proximal diameter, and the following three times as long as the proximal diameter; the third and following have prominently expanded and overlapping distal ends which are especially prominent on the distal side of the pinnule where they are armed with long and prominent spines. P_2 is about half as long as P_1, with 7 segments which are very long with very strongly everted spinous distal ends, especially on the distal side; a large genital gland runs from the base of the third to the base of the sixth segment. Similar genital glands occur on the following pinnules to and including P_5.

The large specimen from Stat. 99 resembles that from Stat. 289.

The individual from Stat. 105 has 10 cirrus segments.

The two from Stat. 125 resemble those described from Stat. 50; the arms are 25 mm. long; the cirri are 4.5 mm. long with 9 segments; there is no genital gland on P_2.

The example from Stat. 289 is large, with the arms 30 mm. long; the cirri are 6 mm. long, composed of 10 segments; P_1 is from 4 mm. to 4.5 mm. long, with 10—12 segments; there is no genital gland on P_2.

The specimen from Banda is even larger, with the arms 35 mm. long; there are 10 cirrus segments.

3. *Compsometra incommoda* (Bell).

BELL. Ann. and Mag. Nat. Hist. [6], vol. 2, 1888, p. 404 (*Antedon incommoda*).
P. H. CARPENTER. Proc. Roy. Soc. Victoria (N. S.), vol. 1, 1889, p. 135 (*Antedon* sp. nov.)
BELL. Ann. and Mag. Nat. Hist. [6], vol. 3, 1889, p. 292 (*Antedon incommoda*; supposed identity with *A. pumila* [= *Compsometra lovéni*]).
A. H. CLARK. Proc. U. S. National Museum, vol. 38, 1910, p. 275 (*Compsometra lacertosa*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 13, pp. 442, 443, 444, 464, 465 (*Compsometra incommoda*).
—— Memoirs of the Australian Museum, vol. 4, 1911, p. 792 (*Compsometra incommoda*).
—— Proc. U. S. National Museum, vol. 43, 1912, pp. 382, 405 (*Compsometra incommoda*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 52 (*Compsometra incommoda*).

4. *Compsometra iris* A. H. Clark.

A. H. CLARK. Notes from the Leyden Museum, vol. 34, 1912, p. 131 (*Compsometra iris*).

Stat. 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. 1 Ex.

The centrodorsal is very low hemispherical, the bare polar area almost covered with pits representing obsolete cirrus sockets.

The cirri are XXX, 10—12, 8 mm. to 9 mm. long, the outer portion strongly recurved; the first segment is very short, the second about twice as long as the median diameter, the third about three times as long as the median diameter, the fourth about as long as the third; the following gradually decrease in length so that the antepenultimate is sligtly longer than broad, and the penultimate about as long as broad; the second and third are strongly constricted centrally with expanded ends; the following gradually lose this character and become laterally flattened and hence broader in lateral view, the outer segments being nearly or quite

twice as broad dorsoventrally as the proximal; opposing spine large and prominent, triangular, arising from the entire dorsal surface of the penultimate segment, directed obliquely forward.

The distal borders of the radials are even with the rim of the centrodorsal; the IBr_1 are short, almost entirely divided in the median line by the posterior process of the axillary, well separated interradially, not in contact basally.

The IBr_2 (axillaries) are rhombic, all the sides strongly concave, about as broad as long, widely separated from their neighbors.

The 10 arms are 45 mm. long; they resemble those of *C. serrata*, but the distal edges of the brachials, while overlapping and spinous, are much less conspicuously and more finely spinous, and lack the strongly marked longitudinal ridges running inward from each of the spinous processes.

Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth and distally at intervals of three oblique muscular articulations.

P_1 is 8.5 mm. long, moderately slender, composed of 17—18 segments of which the first two are broader than long, the third is about twice as long as the median breadth, and the remainder are approximately three times as long as broad, and somewhat longer distally; the third and following have slightly projecting and overlapping distal edges, this increasing distally. P_2 is much smaller and more slender than P_1, 4 mm. long with 11 segments of which the first two are short, the third is half again as long as broad, and the following rapidly become elongated; the segments have moderately produced spinous overlapping distal edges. P_3 is from 3.0 mm. to 4.5 mm. long with about 11 segments; it tapers less rapidly than P_2 and thus appears stouter, especially distally. P_4 is similar to P_3, but slightly longer and slightly stouter. The distal pinnules are very slender, 7 mm. long with 16—17 segments which have slightly spinous distal edges.

5. *Compsometra serrata* (A. H. Clark).

A. H. Clark. Bull. Mus. Comp. Zoöl., vol. 51, 1908, N° 8, p. 240, pl. 1, fig. 4 (*Antedon serrata*).
—— Proc. Biol. Soc. Washington, vol. 21, 1908, p. 131 (*Compsometra serrata*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 316 (*Compsometra serrata*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 192 (*Compsometra serrata*).

6. *Compsometra lovéni* (Bell).

Wright. Proc. Roy. Irish Acad. [2], vol. 2, 1877, p. 754 (?*Kallispongia archeri*).
Bell. Proc. Zoöl. Soc. London, 1882, p. 534 (*Antedon lovéni*).
—— "Alert" Report 1884, p. 157, pl. 10, figs. B, B*a*, *b* (*Antedon pumila*; based upon the same specimens as the preceding).
—— Proc. Linn. Soc. New South Wales, vol. 9, 1885 [1884], p. 497 (*Antedon pumila*).
P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 56, paragraph 3 (*Antedon lovéni*; *Antedon pumila*).
Bell. Ann. and Mag. Nat. Hist. [6], vol. 3, 1889, p. 392 (*Antedon pumila*, part).
Whitelegge. Journ. Roy. Soc. New South Wales, vol. 23, 1889, p. 197 (*Antedon pumila*).
P. H. Carpenter. Proc. Roy. Soc. Victoria (N. S.), vol. 2, 1890, p. 135 (*Antedon pumila*).

RAMSAY. Records of the Australian Museum, vol. 1, 1890, p. 84 (*Antedon pumila*).
A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 481 (*Antedon lovéni*).
—— Proc. U. S. National Museum, vol. 38, 1910, p. 275 (*Compsometra lovéni*).
—— Die Fauna Südwest-Australiens, vol. 3, 1911, Lief. 3, pp. 442, 443, 444 (*Compsometra lovéni*); p. 466 (? *Compsometra* sp.).
—— Memoirs of the Australian Museum, vol. 4, 1911, pp. 717, 718, 722, 735, 790 (*Compsometra lovéni*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 53 (*Compsometra lovéni*).

Compsometra crispa (A. H. Clark) from the Hawaiian Islands I am now convinced does not belong to this genus; its generic position is uncertain, but it appears to be closely related to the species of *Andrometra*.

Andrometra A. H. Clark.

Key to the Species of the Genus Andrometra.

a¹ Larger, arms about 60 mm. long; cirri about LXX; P_1 6 mm. long with 9 segments; P_2 10 mm. long with 15 segments; P_3 8 mm. long with 15 segments; P_4 like P_3; P_5 5 mm. long with 10 segments (Andaman Islands; 202 Metres). . . . *indica*

a² Smaller, arms not over 55 mm. long; cirri XXX—XXV, 15—16, 7 mm. long; P_1 4 mm. long with 8—10 segments; P_2 7 mm. long with 11 segments; P_3 resembling P_2 but shorter, about as long as P_1; P_4 still shorter (southern Japan; 54—192 [?250] Metres). . . . . *psyche*

1. *Andrometra indica* (A. H. Clark).

A. H. CLARK. Crinoids of the Indian Ocean, 1912, p. 243, fig. 46, p. 243 (*Eumetra indica*).

2. *Andrometra psyche* (A. H. Clark).

A. H. CLARK. Bull. Mus. Comp. Zoöl., vol. 51, 1908, N° 8, p. 241, pl. 1, figs. 2, 3 (*Antedon psyche*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 317 (*Iridometra psyche*).

Toxometra A. H. Clark.

The only species in the genus *Toxometra* is

1. *Toxometra paupera* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 560 (*Toxometra paupera*).
—— Notes from the Leyden Museum, vol. 34, 1912, p. 138 (*Toxometra purpurea*).

Stat. 79ª. 2° 38′.5 S., 117° 46′ E. Borneo Bank. 54 Metres. 2 Ex.
Stat. 96. Southeastern side of the Pearl Bank, Sulu Archipelago. 15 Metres. 2 Ex.
Stat. 99. 6° 7′.5 N., 120° 26′ E. Anchorage off North Ubian. 16—23 Metres. 2 Ex.
Maumeri, Flores. Coral reef. 1 Ex.

The larger specimen from Stat. 96 I at first considered as representing a new species. It may be described as follows:

The centrodorsal is small, truncated hemispherical, the cirrus sockets arranged in three closely crowded alternating marginal rows; the dorsal pole is small and papillose.

The cirri are XXIV, 13—16, 10 mm. long, recalling those of *Antedon petasus* but smoother dorsally and more slender proximally; the first segment is short, the second slightly longer, the third as long as broad or slightly longer than broad, the fourth slightly longer than the third, the fifth and sixth the longest, twice as long as the proximal diameter; the following gradually become laterally composed and, though remaining actually of the same length, increase in lateral diameter and become therefore relatively shorter so that the last four before the penultimate are slightly longer than broad; in the proximal portion te cirri are in lateral view slender, and rounded in cross section; in the distal half they become strongly compressed and in lateral view about twice as broad as in the proximal half; there are no dorsal processes; the opposing spine is short, subterminal to submedian, its base involving only a small part of the dorsal surface of the segment, in height scarcely one third the distal diameter of the penultimate segment, directed obliquely forward; the terminal claw is somewhat longer than the penultimate segment, stout and strongly curved.

The radials are just visible beyond the rim of the centrodorsal; their distal angles are separated.

The IBr_1 are short about four times as broad as long in the median line, trapezoidal, widely separated interradially, the sides making an angle of nearly 120° with those of their neighbors.

The IBr_2 are broadly pentagonal; the anterior angle is approximately 90°; the lateral edges are nearly as long as those of the IBr_1 and make with them an angle of about 120°. The synarthrial tubercles are rather prominent, and the elevation is continued somewhat anteriorly onto the axillary.

The first brachials are short, over twice as broad as long exteriorly, the exterior length being rather more than twice as great as the interior; the inner edges are united basally, but distally diverge at a very broadly obtuse angle.

The second brachials are about twice as large as the first, irregularly quadrate.

The first syzygial pair (composed of the third and fourth brachials) is nearly twice as long interiorly as exteriorly, the inequality falling chiefly in the hypozygal, twice as broad as long in the median line.

The next four brachials are slightly wedge-shaped, twice as broad as the greater length, then becoming triangular, about as long as broad, and after the proximal quarter of the arm wedge-shaped, about as long as broad, and somewhat longer terminally.

Syzygies occur between the third and fourth, ninth and tenth and fourteenth and fifteenth brachials, and distally at intervals of three oblique muscular articulations.

P_1 is 5.5 mm. long, composed of 15 segments of which the first is short, the second longer, the third nearly as long as broad, the fourth slightly longer than broad, and the seventh and following about twice as long as broad; the pinnule is small and slender, and tapers evenly from the base to a slender and delicate tip; there is a slight swelling on the distal edge of the second and third segments.

P_2 is 7.5 mm. long with 16 segments, resembling P_1 but proportionately stouter; the distal edges of the third and following segments are slightly produced and finely spinous; as in P_1 the dorsal edge of the second and third segments is slightly thickened.

P_3 is 12 mm. to 13 mm. long with 22 segments, resembling P_2 but proportionately stouter.

P_4 is 5.0 mm. to 5.5 mm. long with 14 segments, similar in size to P_2 but with the distal segments very slightly shorter.

P_5 is 6 mm. long with 15 segments, slightly stouter than P_4 and not tapering so rapidly.

The distal pinnules are 6.5 mm. long with 16 segments, very slender, the segments beyond the two basal much elongated.

The colour in spirits is deep purple, banded with yellowish at the articulations; the lower pinnules are yellowish.

The specimens from Stats. 79[a] and 99, and the smaller from Stat. 96, have an arm length of between 25 mm. and 30 mm.; that from Maumeri is large, but badly broken.

Iridometra A. H. Clark.

Key to the Species of the Genus Iridometra.

a[1] Cirri not slender, the longest segments rarely more than four times as long as the median diameter, with the articulations only very slightly enlarged; P_1 and P_2 with 16—19 segments; P_2 slightly longer than P_1

b[1] P_1, P_2 and P_3 of approximately the same length (P_3 slightly longer than P_2, which is slightly longer than P_1), with 18—20 segments; cirri XL, 12—17 (rarely more than 15), 10 mm. to 12 mm. long; arms 35 mm. to 60 mm. long (southern Japan; 23—192 [?250] Metres) . . . . . *adrestine*

b[2] P_1 and P_2 of approximately the same length (P_2 slightly longer than P_1), with 16 segments, but P_3 shorter with 13 segments; cirri XXX—L, 15—19 (usually 16—18), 10 mm. to 14 mm. long; arms about 50 mm. long (China Sea, near Hong Kong; 158—180 Metres). . . . . *melpomene*

a[2] Cirri exceedingly slender with greatly elongated segments of which the proximal are at least six times as long as the median diameter, with greatly swollen articulations; P_1 and P_2 similar, the latter usually slightly shorter than the former, with 11—13 segments; P_3 smaller, with 8—9 segments, arms 40 mm. — 50 mm. long (Philippine Islands; 62—140 Metres) . . . . . *exquisita*

1. *Iridometra adrestine* (A. H. Clark).

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 340 *Antedon adrestine*); p. 341 (*Antedon minuta*).

2. *Iridometra melpomene* A. H. Clark.

A. H. Clark. Proc. U.S. National Museum, vol. 39, 1911, p. 559 (*Iridometra melpomene*).

This species is infested with a curious amphipod parasite which bores into the disk,

possibly the same as that mentioned by VON WILLEMOES—SUHM of which the specimens were subsequently lost. A detailed description of the form, by Mr CLARENCE R. SHOEMAKER, is now in press.

3. *Iridometra exquisita* A H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1909, p. 408 (*Iridometra exquisita*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 559 (*Iridometra exquisita*).

The original specimen upon which this species is based is small and probably immature. The long P_1 and the rather unusually spinous condition of the distal ends of the pinnule segments suggest a comparison with the small species of *Compsometra*; but the relatively large P_2 shows that it cannot be referred to the genus. The specimen recorded in 1911 (Cat. N° 36024 U. S. National Museum) appears to be a more developed individual of the same species; the arms are about 50 mm. long, and the cirri are 11 mm. long; P_1 is 5 mm. long, with 12 segments; P_2 is also 5 mm. long, with 11 segments, similar to P_1; P_3 is 4 mm. long with 9 segments, proportionately shorter and more slender; P_4 is similar, with 8 segments, nearly or quite as long; P_5 is 4 mm. long with 10 segments.

Eumetra A. H. Clark.

Key to the Species of the Genus Eumetra.

a^1 Cirri very long and slender, from the third to one half of the arm length, composed of 25—33 (usually 25—26) much elongated segments of which the longest are about five times as long as the proximal diameter, and the last three or four are about two and one half or three times as long as broad; no opposing spine; terminal claw very slightly curved (Philippine Islands; 141—144 Metres) . . . . . *chamberlaini*

a^2 Cirri shorter and less slender, about one quarter of the arm length, composed of 16—18 segments which are not especially long, the longest proximal (fifth-seventh) being nearly or quite three times as long as broad proximally, and the last three or four less than twice as long as the distal breadth; a prominent opposing spine; terminal claw strongly curved (Lesser Sunda Islands; 69—73 Metres). . . . . *aphrodite*

1. *Eumetra chamberlaini* A. H. Clark.

A. H. CLARK. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 231 (*Eumetra chamberlaini*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 563 (*Eumetra chamberlaini*).

2. *Eumetra aphrodite* A. H. Clark.

A. H. CLARK. Notes from the Leyden Museum, vol. 34, 1912, p. 137 (*Iridometra* [*Eumetra*] *aphrodite*).

Stat. 49a. 8° 23′.5 S., 119° 4′.6 E. Sapeh Strait. 69 Metres. 7 Ex.
Stat. 294. 10° 12′.2 S., 124° 27′.3 E. Timor Sea. 73 Metres. 35 Ex.

The centrodorsal is low hemispherical, stout 2.9 mm. in diameter at the base, almost completely covered with cirrus sockets; the small dorsal pole is papillose, as in *E. chamberlaini*.

The cirri are XXXV—L, 16—18, 16 mm. to 18 mm. long; the first segment is very short, the second about twice as broad as long, the third nearly or quite as long as the proximal diameter, the fourth from two to two and one half times as long as the proximal diameter, the fifth-seventh the longest, nearly or quite three times as long as the proximal diameter; the following very gradually decrease in length so that the antepenultimate is from one third to one half again as long as broad; the cirri are not especially slender; they become moderately compressed laterally in the distal half; the longer earlier segments have a slight central constriction, and the shorter distal have the proximal dorsal angle cut away so that the distal dorsal angle of the preceding appears prominent; all the segments have prominently overlapping distal ends; the cirri do not taper distally.

The division series and arm bases resemble those of *E. chamberlaini*; the distal intersyzygial interval is three oblique muscular articulations.

P_1 is 5.5 mm. long, composed of 11 or 12 segments of which the first is not quite as long as broad, the second is about as long as broad, the third is half again as long as broad, and the remainder are about twice as long as broad. The pinnule is slightly stiffened, and tapers evenly from the base to the tip.

P_2 is 7 mm. long with 15 segments of which the first is twice as broad as long, the second is nearly as long as broad, the third is half again as long as broad, and the remainder are about twice as long as broad. The pinnule is proportionately stouter than P_1, and the outer segments have slightly prominent distal angles and slightly spinous distal edges.

P_3 is 10 mm. long with 19 segments, resembling P_2 but tapering slightly less rapidly and with the outer segments relatively longer.

P_4 is from 4.5 mm. to 5.5 mm. long with 10—13 segments, smaller than P_2, though similar to it.

P_5 is 6.5 mm. long with 14 segments.

The distal pinnules are extremely slender, 8 mm. long with 17 segments.

The arms are about 75 mm. long.

Dorometra A. H. Clark.

Key to the Species of the Genus Dorometra.

a[1] P_2 resembling P_1 in size and in number of segments, or slightly smaller
  b[1] cirrus segments relatively short, the longest about two and one half times as long as broad, the penultimate and antepenultimate not more than one third again as long as broad; arms from 30 mm. to 45 mm. in length
    c[1] P_3 with 18—20 segments, 6 mm. to 7 mm. long, slender and flagellate; P_1 3.5 mm. long with 12 segments; P_2 similar but slightly smaller, 2.7 mm.

long with 11 segments; P_4 longer than P_1 and P_2, 4 mm. long with 13 segments (Madagascar and Mauritius; littoral). . . . . *mauritiana*

c^2 P_3 with 13 segments, 8 mm. long, less slender; P_1 and P_2 equal, 4.5 mm. long with 10 segments; P_4 shorter than P_1 and P_2, 3 mm. long with 10 segments (Binongka; 54 Metres) . . . . . *gracilis*

b^2 cirrus segments much elongated, with much expanded distal ends; arms from 23 mm. to 30 mm. long

c^1 P_3 more than twice as long as P_1 and P_2 with much more numerous segments, 7 mm. long with 16 segments; P_1 and P_2 2.5 mm. long with 8—9 segments; cirri XXX—XL, 10—12 (Maldive Islands to northern Australia, the Tonga Islands, the Philippines and the Macclesfield Bank; 0—74 Metres) . . . . . *nana*

c^2 P_3 not greatly longer than P_1 and P_2, 2.9 mm. long with 9 segments; P_1 and P_2 2.5 mm. long with 7 segments; cirri XX, 12—14 (Korean Straits; 106 Metres) . . . . . *briseis*

a^2 P_2 intermediate in size and in number of segments between P_1 and P_3

b^1 cirri not especially slender, the longest segments not more than about twice as long as the diameter of the expanded ends

c^1 P_1 3.2 mm. to 4 mm. long with 10—15 segments; P_2 6 mm. long with 13—14 or more segments; P_3 9 mm. to 10 mm. long with 17—19 segments; P_4 4.5 mm. long, or longer, with 13 segments; P_5 4.5 mm. long with 12 segments; cirri XXXV—XL, 10—15; arms 50 mm. to 60 mm. long (Philippine Islands; 0—32 Metres). . . . . *parvicirra*

c^2 P_1 5 mm. long with 8 segments; P_2 9.5 mm. with 12 segments; P_3 13 mm. long with 18—20 segments; P_4 4.5 mm. to 5 mm. long; P_5 slightly longer; cirri XXV, 14—16 (usually 15—16), 13 mm. long; arms about 40 mm. long (Suez Bay; 18 Metres). . . . . *aegyptica*

b^2 cirri excessively slender and delicate, the earlier segments about four times as long as the diameter of the expanded ends, the penultimate twice as long as broad; cirri with 11—12 segments, 9 mm. long; P_1 2 mm. long with 8 segments; P_2 3.5 mm. long with 8—9 segments; P_3 4.5 mm. long with 9 segments; arms 40 mm. long (Moluccas; 95 Metres). . . . *clymene*

1. *Dorometra gracilis* (A. H. Clark).

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 138 (*Iridometra gracilis*).

Stat. 220. Anchorage off Pasir Pandjang, western coast of Binongka. 54 Metres. 1 Ex.

The cirri are 7 mm. long, composed of 10 segments of which the third and fourth are the longest, two and one half times as long as the diameter of the greatly expanded distal ends, and the antepenultimate is one third again as long as broad.

The arms, which resemble those of the other species of the genus, are 35 mm. long.

P_1 and P_2 are very slender, 4.5 mm. long, composed of 10 segments. P_3 is 8 mm. long, composed of 13 segments. P_4 is 3 mm. long, composed of 8 segments. P_5 is 4 mm. long with 10 segments, and bears a genital gland. Beyond the second the segments of these pinnules have overlapping and spinous distal edges, which are especially prominent on the distal side.

2. *Dorometra mauritiana* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 40, 1911, p. 40 (*Iridometra mauritiana*).
—— Proc. U. S. National Museum, vol. 43, 1912, p. 405 (*Iridometra mauritiana*).
—— Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 257 (*Iridometra mauritiana*).

3. *Dorometra nana* (Hartlaub).

HARTLAUB. Nova Acta der Ksl. Leop.-Carol. deutschen Akad. der Naturforsch., vol. 58, 1891, N° 1, p. 89, pl. 5, figs. 57, 58 (*Antedon nana*).
A. H. CLARK. Vidensk. Med. fra den naturhist. Forening i København, 1909, p. 192 (*Iridometra nana*).
—— Crinoids of the Indian Ocean, 1912, p. 231 (*Iridometra nana*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, p. 32 (*Iridometra nana*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 54 (*Iridometra nana*).
H. L. CLARK. Publications of the Carnegie Institution of Washington, N° 212, 1915, p. 106 (*Iridometra nana*).

Stat. 144. Anchorage north of Salomakiče (Damar) Island. 45 Metres. 1 Ex.
Stat. 250. Anchorage off Kilsuin, western coast of Kur Island. 20—45 Metres. 1 Ex.

The specimen from Stat. 144 has the arms 25 mm. long.

That from Stat. 250 is typical of the species; the arms are 30 mm. long; the colour is white, banded across the base of each brachial and pinnular with dark purple, the cirri faintly pinkish with a narrow band of light purple at the base of each segment.

4. *Dorometra briseis* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 83 (*Antedon briseis*).

5. *Dorometra parvicirra* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 204, pl. 36, figs. 7, 8 (*Antedon parvicirra*).
A. H. CLARK. Smithsonian Miscellaneous Collections, (Quarterly Issue), vol. 52, 1908, part 2, p. 232 (*Iridometra scita*).
—— Proc. U. S. National Museum, vol. 39, 1911, p. 559 (*Iridometra parvicirra*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 54 (*Iridometra scita*).

Stat. 99. 6° 7'.5 N., 120° 26' E. Anchorage off North Ubian. 16—23 Metres. 1 Ex.

At Stat. 99 there was secured a very small specimen of this species with arms 18 mm. long and cirri 5 mm. to 7 mm. long, composed of 11 segments.

A reëxamination of the type specimen of my *Iridometra scita*, which I now consider merely a synonym of CARPENTER's *Antedon parvicirra*, shows that in the original description

the relative proportions of the lower pinnules, by some curious accident, were wrongly described. P_1 is 3.2 mm. long with 10—11 segments; P_2 is 6 mm. long with 13—14 segments, proportionately stouter than P_1; P_3 is 9 mm. to 10 mm. long with 17—19 segments, the largest pinnule on the arm; P_4 is 4.5 mm. long with 13 segments; P_5 is 4.5 mm. long with 12 segments, slightly stouter than P_4 and bearing a genital gland. The cirri are about XXXV, 13—15, 10 mm. long; the longest segments (the third and fourth) are twice as long as the diameter of the expanded ends; the last two before the penultimate are only slightly longer than broad. The arms are 60 mm. long.

6. *Dorometra aegyptica* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 40, 1911, p. 42 (*Iridometra aegyptica*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 53 (*Iridometra aegyptica*).

7. *Dorometra clymene* nov. sp.

Stat. 167. 2° 35'.5 S., 131° 26'.2 E. Ceram Sea. 95 Metres. 1 Ex.

The cirri are exceedingly slender, 9 mm. long, composed of 11—12 segments of which the longer proximal are about four times as long as the diameter of the much expanded distal ends and the penultimate is twice as long as broad; the opposing spine is indicated by a very minute tubercle, or is absent altogether; the terminal claw is very slender, and only slightly curved.

The arms are 40 mm. long, and resemble those of the other species of the genus.

P_1 is 2 mm. long with 8 segments. P_2 is 3.5 mm. long with 8—9 segments. P_3 is 4.5 mm. long with 9 segments. P_4 is shorter and smaller than P_3.

Hybometra A. H. Clark.

The only species in the genus *Hybometra* is

1. *Hybometra senta* A. H. Clark.

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 54 (*Hybometra senta*).

2nd Subfamily Thysanometrinae A. H. Clark.

Key to the Genera of the Subfamily Thysanometrinae.

a^1 P_2 with the third segment as long as, or longer than, broad, and the following segments markedly longer than broad (southern Japan and the Admiralty Islands; 126—355 Metres). . . . . **Thysanometra**

a^2 P_2 with the third segment broader than long, and the fourth broader than long, or about as long as broad (Caribbean Sea, and northward to North Carolina; 13—1029 Metres). . . . . **Coccometra**

Thysanometra A. H. Clark.

Key to the Species of the Genus Thysanometra.

a¹ Brachials following the second syzygy wedge-shaped, twice as broad as long, soon becoming oblong, much broader than long; arms 110 mm. long; cirri LX—LXX, 15—17, 35 mm. long; P_1 14 mm. long with 35—40 short segments; P_2 10 mm. long with 20 segments of which all but the basal three or four are much elongated (southern Japan; 126—355 Metres). . . . . *tenelloides*

a² Brachials beyond the second syzygy triangular, as long as broad, in the outer part of the arm becoming very obliquely wedge-shaped and longer than broad; arms 55 mm. long; cirri XXX+, 15—25+; P_2 about the same length as P_1, but composed of stouter and more elongate segments (Admiralty Islands; 270 Metres). . . . . *tenuicirra*

1. *Thysanometra tenelloides* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 73 (*Antedon tenelloides*).

2. *Thysanometra tenuicirra* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 186, pl. 30, figs. 4—8; pl. 33, fig. 4—5; (*Antedon tenuicirra*).

A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 64 (*Thysanometra tenuicirra*).

There is an unrecorded specimen of this species in the collection of the U. S. National Museum (Cat. N° 36012) which was collected by the "Albatross" at Stat. 5221, between Marinduque and Luzon, Philippine Islands, in 347 Metres.

Coccometra A. H. Clark.

Key to the Species of the Genus Coccometra.

a¹ 24—28 cirrus segments; cirri very slender, with the fourth and following segments greatly elongated, four to five or more times as long as broad; terminal claw straight, tapering to a sharp point; arms 60 mm. to 70 mm. long; there is a large black spot on either side of each syzygial pair; P_1 9 mm. long with 35—40 segments; P_2 5 mm. long with 12—15 segments (southeast of Santiago de Cuba; 455 Metres) . . . . . *guttata*

a² Not more than 25 cirrus segments of which the distalmost are much shorter than the elongate proximal, the penultimate being about as long as broad and the antepenultimate and at least one of those immediately preceding being much less than twice as long as broad; terminal claw recurved

b¹ segments in the distal half of P_1 very short, like those in the proximal half; no black markings; ossicles of the division series and lower brachials

with smooth borders; cirri with the antepenultimate and preceding segments markedly longer than broad; arms 40 mm. to 100 mm. long; cirri XXX—L, 17—19, 10 mm. to 14 mm. long; P_1 about 10 mm. long with 40 segments; P_2 about the same length, or slightly shorter, with 20 segments (from North Carolina southward to Sombrero and Cuba; 13—1029 Metres). . . . . *hagenii*

b^2 segments in the distal half of P_1 becoming elongated, twice as long as broad, with very spinous distal edges; division series and proximal portion of the arms with a prominent black median line; remainder of arms with a large median black spot on each syzygial pair; ossicles of the division series and brachials with prominently everted and very spinous borders; cirri with the antepenultimate and several of the preceding segments very slightly, if at all, longer than broad; arms probably from 50 mm. to 60 mm. long; cirri XXX—XL, 17—23, 16 mm. to 18 mm. long; P_1 7.5 mm. long with 35 + segments; P_2 7.0 mm. long with 15 segments (Puerto Rico to Yucatan, and southward to Jamaica; 41—367 Metres) . . . *nigrolineata*

1. *Coccometra guttata* nov. sp.

"Albatross" Stat. 2134. 19° 56′ 06″ N., 75° 47′ 32″ W. 455 Metres. 1 Ex.

The centrodorsal is small hemispherical or subconical, the polar area rather small and papillose.

The cirri are XXX—XL, 24—28, very slender, 25 mm. long; the first two segments are short, the third is about half again as long as broad, and the remainder are four or five times as long as broad, or even longer; the antepenultimate segment tapers slightly from the proximal to the distal end; the penultimate segment is about half as long, and tapers to the base of the terminal claw; the last is about half as long as the penultimate segment, perfectly straight, and tapers to a sharp point; the cirri are perfectly smooth with no trace of dorsal processes on the distal segments, nor of an opposing spine.

There are no basal rays. The radials are just visible in the median line, extending up in the interradial angles in the form of a triangle. The IBr_1 are oblong, about two and one half times as broad as long, widely separated laterally. The IBr_2 (axillaries) are almost triangular, with the posterior edge slightly convex and the anterior angle long and acute; they are somewhat broader than the IBr_1.

The ten arms are from 60 mm. to 70 mm. long. The first brachial is wedge-shaped, longer outwardly than inwardly, the inner sides in apposition basally; the second brachial is similar, but rather larger and more irregular in shape; the first syzygial pair (composed of the third and fourth brachials) is approximately as long as wide; the following brachials to the eighth are slightly wedge-shaped, not quite so long as broad; the second syzygial pair (comprising the ninth and tenth brachials) is not quite twice as long as broad; the succeeding brachials are obliquely wedge-shaped, about as long as, or rather longer than, broad, becoming

less and less obliquely wedge-shaped distally, and finally oblong and elongate. All the brachials are perfectly smooth, with no ornamentation of any kind.

Syzygies occur between the third and fourth, ninth and tenth and fourteenth and fifteenth brachials, and distally at intervals of two oblique muscular articulations.

P_1 is 9 mm. long, very flexible and slender, composed of 35—40 short segments most of which are about as long as broad with all the angles cut away and hence appearing rounded, those in the terminal third becoming slightly elongated; the articulations are enlarged, and the whole pinnule suggests a string of small beads. P_2 is 5 mm. long with 12—15 segments of which the first two are about as long as broad, and the fourth and following rapidly become elongated, and very slender distally; the fifth, sixth and seventh segments bear a large rounded genital gland; the following pinnules to P_8 are similar, but the genital gland gradually moves nearer the base of the pinnule, on P_8 extending from the third to the sixth segment. The distal pinnules are 12 mm. long with 20 segments of which the first is very short, almost band-like, the second is almost triangular, the third is about half again as long as broad, the fourth is about twice as long as broad, and the remainder become progressively elongated.

The colour in spirits is yellowish white, with a large black spot on each side of each syzygial pair; the inner half of the articular faces of the syzygies is also black.

The specimen described is Cat. N° 22675 U. S. National Museum.

1. *Coccometra nigrolineata* nov. sp.

H. L. Clark. Bull. U. S. Fish Commission for 1900 [1901], part 2, p. 235 (*Antedon hagenii*).
Hartlaub. Mem. Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 385, pl. 9, fig. 13; pl. 15, fig. 3 (*Antedon cubensis*, part).
A. H. Clark. in Hartlaub, tom. cit., p. 389, pl. 9, fig. 13 (*Coccometra nigrolineata*).

"Albatross" Stat. 2138. 17° 44′ 05″ N., 75° 39′ 00″ W. (southeast of the southeastern point of Jamaica); 41 Metres.
"Albatross" Stat. 2327. 23° 11′ 45″ N., 82° 17′ 54″ W. (off Havana, Cuba). 327 Metres.
"Albatross" Stat. 2335. 23° 10′ 39″ N., 82° 20′ 21″ W. (off Havana). 367 Metres.
"Albatross" Stat. 2341. 23° 11′ 00″ N., 82° 19′ 06″ W. (off Havana). 257 Metres.
"Albatross" Stat. 2354. 20° 59′ 30″ N., 86° 23′ 45″ W. (eastern coast of Yucatan). 234 Metres.
"Albatross" collection. Off Havana, without further data.
"Fish Hawk" Stat. 6067. Mayaguez Harbour, Puerto Rico; Point del Algarrobo bearing E. by $^1/_2$ N., $5^3/_4$ miles distant (magnetic). 175—216 Metres.

The centrodorsal is hemispherical or subconical, the polar area finely papillose with a rounded tubercle at the apex.

Cirri XXX—XL, 17—23 (usually 21—22), 16 mm. to 18 mm. long; the first two segments are short, about twice as broad as long, the third is about twice as long as broad, the fourth-eighth or -ninth are greatly elongated, four or five times as long as broad, and the following decrease rapidly in length so that the terminal six to eight are about as long as broad; the elongate proximal segments are somewhat "dice-box shaped" with swollen articulations; the shorter distal segments increase gradually in diameter from the proximal to the distal ends, the latter slightly overlapping the bases of the succeeding segments; on the distal part of the dorsal side of the penultimate segment there is a very small opposing spine which

in height does not reach a third of the diameter of the segment; the terminal claw is about as long as the penultimate segment, and is moderately curved.

There are no basal rays.

The radials are only visible in the interradial angles. The IBr_1 are very short with a concave anterior border which in the median line nearly reaches the straight posterior border. The IBr_2 (axillaries) are roughly rhombic with a rounded posterior prolongation; the anterior angle is sharp and greatly produced. The IBr series are normally just in apposition laterally, but are not laterally flattened.

The 10 arms are probably between 50 mm. and 60 mm. long. The first brachial exteriorly is about half as long as broad, but becomes reduced almost to a point interiorly, and is deeply incised in the median line by the considerably larger irregular second brachial. The first syzygial pair (composed of the third and fourth brachials) is wedge-shaped, much longer interiorly than exteriorly. The following brachials are rather short, after the twelfth, becoming more triangular, about as long as broad. The proximal brachials as far as the eighth have slight alternating lateral tubercles. The edges of the ossicles of the IBr series and the lower brachials are everted, prominent, and very spiny.

Syzygies occur between the third and fourth, ninth and tenth and fourteenth and fifteenth brachials, and distally at intervals of two oblique muscular articulations.

P_1 is 7.5 mm. long, slender, composed of 35 or more short segments, those in the proximal half about as long as broad with the corners cut away, those in the distal half becoming gradually somewhat elongated, the very slender terminal segments being about three times as long as broad. P_2 is 7 mm. long, considerably stouter and less flexible than P_1, with about 15 segments of which the first three are about as long as broad and the following become elongated, the sixth over twice as long as broad and the terminal four or five times as long as broad. The following pinnules as far as P_7 are similar, after which the pinnules become longer and more slender with the first two segments slightly enlarged, the first short, the second about as long as broad, the remainder elongated.

The colour in spirits is white with a median line of black on the IBr series and the lower portion of the arms, beyond which each syzygial pair bears a transverse black band or large black spot; ventrally the disk is black, and the perisome of the arms is yellowish banded with black.

The specimen described is Cat. N° 22674 U. S. National Museum.

2. *Coccometra hagenii* (Pourtalès).

POURTALÈS. Bull. Mus. Comp. Zoöl., vol. 1, N° 6, 1868, pp. 105, 111, 125 (*Comatula hagenii*); N° 11, 1869, p. 355 (*Antedon hagenii*); vol. 5, N° 9, 1878, p. 214 (*Antedon hagenii*).

P. H. CARPENTER. Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, pp. 154—156 (*Antedon hagenii*).

VON GRAFF. Bull. Mus. Comp. Zoöl., vol. 11, 1883, N° 7, pp. 128, 129, 132 (*Antedon hagenii*).

A. AGASSIZ. Bull. Mus. Comp. Zoöl., vol. 15 ("Three Cruises of the 'Blake'", vol. 2), 1888, pp. 124, 127 (*Antedon hagenii*).

HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 389, pl. 8, figs. 1—12; pl. 15, figs. 2, 6 (*Antedon hagenii*).

3rd Subfamily Zenometrinae A. H. Clark.

Key to the Genera of the Subfamily Zenometrinae.

a[1] P_1 and P_a absent (Philippine Islands; 140—148 Metres) . . . **Balanometra**

a[2] P_1 and P_a present

b[1] cirri with all the segments elongated, the distal entirely without dorsal processes; or (very rarely) a few of the outermost cirrus segments may be but little longer than broad with slight dorsal tubercles

c[1] cirrus sockets arranged in closely crowded columns in each radial area; but the groups of columns in each radial area are usually (almost invariably) separated from the groups of columns in the adjacent radial areas by long-triangular bare patches; the distal cirrus segments are always greatly elongated, never with any trace of dorsal processes (from the Galápagos Islands and Panamá northward to the Aleutian Islands, and southward on the Asiatic coast to Yezo Strait and the northern part of the Sea of Japan; the Hawaiian Islands; the Philippine Islands; the lesser Sunda Islands; the Bay of Bengal and the coast of Travancore, and southward to the Antarctic regions; 336—2858 Metres) . . . . . **Psathyrometra**

c[2] columns of cirrus sockets somewhat irregular, and evenly spaced all around the centrodorsal without differentiation into radial groups; the distal cirrus segments may be much elongated with no trace of dorsal processes, or little, if any, longer than broad, with slight dorsal tubercles (from the western coast of Scotland, and Ireland, southward to Madeira, including the entire Mediterranean basin; 45—1292 Metres) . . . . . **Leptometra**

b[2] cirri with the proximal segments more or less elongated, but the distal segments short, never longer than broad, and bearing prominent dorsal processes

c[1] division series and arm bases smooth; 10—14 arms (Kei Islands and northern Cuba; 252—380 Metres) . . . . . **Adelometra**

c[2] division series and arm bases spiny

d[1] size large; cirri with more than 40 (50—60) segments; columns of cirrus sockets very regular, separated interradially by high ridges, or by broad bare areas

e[1] two columns of cirrus sockets in each radial area, the radial areas being separated by high ridges (from St. Lucia, British West Indies, northward to Georgia and Pensacola, Florida; 304—792 Metres) . . . . . **Zenometra**

e² three columns of cirrus sockets in each radial area, the radial areas being separated by broad bare areas (Hawaiian Islands; 346—633 Metres) . . . . . **Sarametra**

d² size small; cirri with less than 30 segments; columns of cirrus sockets on the centrodorsal slightly irregular; interradial areas on the centrodorsal not especially differentiated (Marion Island, and the shores of the Antarctic continent in the vicinity of Gaussberg; 252—400 Metres). . . . **Eumorphometra**

Psathyrometra A. H. Clark.

Key to the Species of the Genus Psathyrometra.

a¹ Centrodorsal very long, much longer than broad, rounded conical; very distinct, though usually narrow, interradial lines running from the ends of the basal rays to the apex divide the sides of the centrodorsal into five radial areas, each of which contains three or four regular columns of cirrus sockets or from five to seven each; the proximal pinnules increase in length and stoutness to P_3, which is longer and stouter than the two preceding pinnules

b¹ four columns of cirrus sockets in each radial area

c¹ cirrus sockets very closely crowded, so that none of the lateral surface of the centrodorsal is visible between them; cirri about 45 mm. long, composed of 25—30 segments; arm length apparently about 100 mm., or rather more (Yezo Strait, Japan; 540—959 Metres) . . . . *fragilis*

c² cirrus sockets not crowded and not in apposition with their neighbors, so that narrow bands representing the lateral surface of the centrodorsal are always visible between them; sometimes the four columns of cirrus sockets in the radial areas alternate small and large, and occasionally there may be only three columns in some, very rarely in all, of the radial areas; cirri about 40 mm. long, composed of 22—25 segments; arm length about 80 mm. (southeastern Alaska; 194—427 Metres). . . . *alascana*

b² three columns of cirrus sockets in each radial area

c¹ larger, arm length about 130 mm.; cirri 55 mm. to 60 mm. long, composed of about 30 segments; cirrus sockets arranged in three regular columns, in contact longitudinally and usually also transversely (from Monterey, California, northward to the Shumagin Islands, and westward to the western Aleutian Islands; 1549—3551 Metres). . . . . *borealis*

c² smaller, arm length about 80 mm.; cirri about 40 mm. long, composed of 22—25 segments; cirrus sockets less crowded, rarely in contact, usually arranged in four columns in each radial area (southeastern Alaska; 194—427 Metres) . . . . . *alascana*

a^2 Centrodorsal shorter, not longer than broad, usually conical, sharply pointed with straight sides

b^1 four columns of cirrus sockets in each radial area

c^1 cirrus sockets very closely crowded against each other; the twenty columns of cirrus sockets are closely crowded all around the centrodorsal, excepting only where the downward extension of the basal rays separates the most proximal sockets of the outermost columns of each radial area (Hawaiian Islands; 720—900 Metres). . . . . *congesta*

c^2 cirrus sockets widely separated from each other, arranged in four, with sometimes a partial fifth, columns in each radial area; narrow interradial lines divide the sides of the centrodorsal into five radial regions, tip of the centrodorsal truncated instead of sharply rounded as in the preceding (Galapagos Islands and Panamá; 693—999 Metres) . . . . *bigradata*

b^2 not more than three columns of cirrus sockets in each radial area

c^1 size large; arms probably between 130 mm. and 150 mm. long; centrodorsal large, a broadly truncated cone, with three complete and equal, very closely placed, columns of four or five (usually four) cirrus sockets in each radial area; relatively broad interradial lines, nearly as broad as the adjacent cirrus sockets, delimit the radial areas; P_1, though similar to the succeeding pinnules, is longer and slightly stouter basally; the cirri are about 50 mm. long, composed of 35—40 segments (northern part of the Sea of Japan; 702—731 Metres) . . . . . *erythrizon*

c^2 smaller, the arms not over 100 m.m. long; centrodorsal a sharply pointed cone or a low hemisphere, never a broadly truncated cone; cirrus sockets arranged in two columns in each radial area, or in two columns with a partial median column

d^1 cirrus sockets in two entire columns and one short and incomplete column in each radial area of the centrodorsal, the incomplete column between the two entire columns, which meet beyond it

e^1 larger, the centrodorsal being from 4 mm. to 5.5 mm. broad at the base and from 4 mm. to 5 mm. high, sharply conical; cirrus sockets very definite in arrangement, the interradial furrows very regular, broad, and well marked

f^1 the incomplete median column of cirrus sockets consists of two sockets, with occasionally a more or less developed third; the radial areas are delimited by deep grooves which are about as wide as the adjacent cirrus sockets; the centrodorsal is 5.5 mm. broad at the base, and measures 5 mm. along the sides (Andaman Sea to the Postillon Islands, north of Sumbawa; 338—794 Metres) . . . . . *major*

f^2 the incomplete median column of cirrus sockets consists of a

single socket; the radial areas are delimited by slightly sunken bare areas from half to quite as wide as the adjacent sockets; the centrodorsal is 4 mm. broad at the base and 4 mm. high (Postillon Islands to the Andamans, and northward to the Gulf of Martaban; 338—794 Metres) . . . . *mira*

e^2 smaller, the centrodorsal being not more than 3.2 mm. in basal diameter, rounded conical; the cirrus sockets are less definitely arranged

f^1 interradial furrows on the centrodorsal broad and distinct, from as wide as the adjacent cirrus sockets to as wide as the entire cirrus bearing portion of the radial areas; cirrus sockets very irregular in arrangement, but usually in two columns with additional sockets toward the proximal border of the centrodorsal; very slender; arms about 100 mm. long; cirri XL—L, 25, 35 mm. long (southwest of Akyab, Burma; 489 Metres) *gracillima*

f^2 interradial furrows on the centrodorsal narrow and more or less obscure; cirrus sockets less irregular in arrangement, 7—9 in each radial area; centrodorsal very low, with rounded sides (Sumbawa to Ceram; 521—835 Metres). . . . . *inusitata*

d^2 cirrus sockets in two columns of from two to four each in each radial area; centrodorsal low, conical, with the tip slightly rounded

e^1 cirrus sockets regularly arranged

f^1 the ten columns of cirrus sockets of 2 (rarely 3) each are closely crowded, without segregation into radial pairs; arms about 80 mm. long; cirri XX, 26—31, 30 mm. to 45 mm. long (Antarctic regions, near Gaussberg; 2725 Metres) . . . . . *antarctica*

f^2 the ten columns of cirrus sockets are segragated into five pairs which are separated by bare interradial spaces

g^1 radial areas delimited by narrow irregular lines; 20 large cirrus sockets, four in each radial area, in two closely crowded columns; centrodorsal rounded conical, 1.7 mm. in diameter at the base, and about 1 mm. from the apex to the interradial border; P_2 bears a gonad (near Saleyer, south of Celebes; 1158 Metres) . . . . . *anomala*

g^2 radial areas delimited by prominent bare interradial spaces from half as wide as to as wide as the adjacent sockets

h^1 larger, the centrodorsal measuring 3.2 mm. across the base and 4 mm. from the apex to the interradial margin; bare interradial areas very regular, about as wide as the adjacent sockets; three or four cirrus sockets in each column (Philippine Islands; 759 Metres) . . . . . *parva*

h^2 smaller, the centrodorsal measuring 1.8 mm. across the base

and 1.6 mm. from the apex to the interradial margin; bare interradial areas very irregular, about half as wide as the adjacent cirrus sockets (north of Sumbawa; 2060 Metres) . . . . . *minima*

e^2 arrangement of the cirrus sockets more or less irregular, these being usually in two columns with additional sockets toward the proximal border of the centrodorsal; interradial furrows on the centrodorsal broad and distinct, from as wide as the adjacent cirrus sockets to as wide as the entire cirrus bearing portion of the radial areas; very slender; arms about 100 mm. long; cirri XL—L, 25, 35 mm. long (southwest of Akyab, Burma; 489 Metres) . . . . *gracillima*

1. *Psathyrometra fragilis* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 80 (*Antedon fragilis*).

2. *Psathyrometra alascana* A. H. Clark.

[Description in press.]

3. *Psathyrometra borealis* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 236 (*Psathyrometra borealis*); p. 237 (*Psathyrometra profundorum*).

4. *Psathyrometra erythrizon* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 79 (*Antedon erythrizon*).

5. *Psathyrometra bigradata* (Hartlaub).

Hartlaub. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N° 4, p. 145, pl. 1, fig. 5 (*Antedon bigradata*).
A. H. Clark. Bull. Mus. Comp. Zoöl., vol. 51, 1908, N° 8, p. 240 (*Psathyrometra* sp.).

6. *Psathyrometra major* A. H. Clark.

A. H. Clark. Records of the Indian Museum, vol. 7, 1912, part 3, N° 26, p. 270 (nomen nudum; "Investigator" Stat. 115; 188—220 fathoms).
—— Notes from the Leyden Museum, vol. 34, 1912, p. 140 (*Psathyrometra major*).

Stat. 45. 7° 24′ S., 118° 15′.2 E. Flores Sea. 794 Metres. 1 Ex.

The centrodorsal is sharply conical with the apex slightly rounded, 5.5 mm. in diameter at the base and 5.0 mm. from the apex to the interradial border; its sides are divided into five radial areas by five interradial furrows which are about as broad as the adjacent cirrus sockets; these furrows are deeper and more V-shaped than those of *Ps. mira*. The cirrus sockets resemble those of *Ps. mira*, but the median incomplete column, instead of containing

only a single socket, consists of two, with in two cases a more or less developed third; of the outer columns six contain three sockets, two four, and two two.

Two cirri are preserved, one whole and one with a broken tip. These are 55 mm. long and consist of 29 segments of which the first is very short, the second about twice as broad as long, the third slightly longer than broad, the fourth about twice as long as the diameter of the distal end, the fifth nearly or quite three times as long as the distal diameter in lateral view, and the sixth-ninth or -tenth slightly longer than the fifth; the following segments decrease almost imperceptibly in length so that the nineteenth and following are about twice as broad as long; from the twentythird segment the cirrus tapers distally to a very slender tip, and the segments increase in proportionate length so that the last preserved is five or six times as long as broad; from the third onward the segments in lateral view are gently concave both dorsally and ventrally, so that the articulations are prominent, but this decreases and disappears in the relatively short distal segments. The cirri are moderately compressed laterally throughout their entire length, and resemble those of the species of *Pentametrocrinus* and *Thaumatocrinus*.

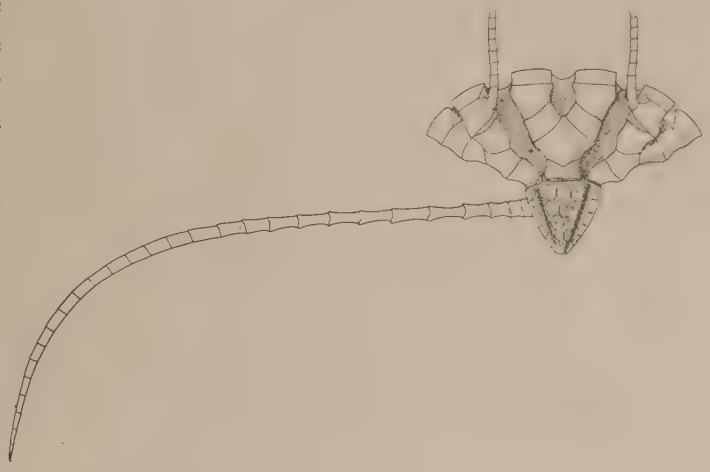


Fig. 12.
Lateral view of the proximal portion of a specimen of *Psathyrometra major* from Stat. 45. About twice natural size. (Courtesy of the U. S. National Museum).

The post-radial series resemble those of *Ps. mira*; the distance from the radial to the first syzygy is 8.0 mm.

The "Investigator" dredged this species at Stat. 115 in the Andaman Sea (11° 31′ 40″ N., 92° 46′ 06″ E) in 338—396 Metres, on green mud; the bottom temperature was 13°.3 C.

7. *Psathyrometra mira* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 36, 1909, p. 648 (*Psathyrometra mira*).
—— Proc. Biol. Soc. Washington, vol. 22, 1909, p. 149 (*Psathyrometra mira*).
—— Records of the Indian Museum, vol. 7, 1912, part 3, N° 26, p. 270 (*Psathyrometra mira*).
—— Crinoids of the Indian Ocean, 1912, p. 235, fig. 43, p. 235 (*Psathyrometra mira*).

Stat. 45. 7° 24′ S., 118° 15′.2 E. Flores Sea. 794 Metres. 1 Ex.
Stat. 170. 3° 37′.7 S., 131° 26′.4 E. Ceram Sea. 924 Metres. 1 Ex.

The specimen from Stat. 45 has the centrodorsal relatively slightly longer than that of the type specimen, though it agrees exactly in all other particulars; it is 4.0 mm. in diameter at the base and 4.25 mm. from the apex to the interradial border.

P_1 is 10 mm. long, composed of 22 segments, at first short, becoming about as long as broad on the eighth, and twice or three times as long as broad terminally; the short earlier segments have their corners cut away as in *Heliometra glacialis*; the pinnule is slender,

and becomes flagellate distally. P_2 is 10 mm. long with 23 segments, resembling P_1. P_3 is 9 mm. long with 21 segments, similar to, but slightly more slender than, the pinnules preceding; it is very slightly less stout basally, but tapers less and lacks the flagellate tip. P_4 is 8 mm. long with 18 segments and resembles P_3.

P_1 has the basal segments more cut away than P_2, and P_2 than P_3; P_1 has a longer flagellate tip than P_2, and is in general more flexible; P_2 differs from P_3 in the same way.

The individual from Stat. 170 is slightly larger with a shorter centrodorsal, the sides of which make a slightly greater angle with each other; the centrodorsal measures 5.6 mm. in diameter at the base and 5.0 mm. from the apex to the interradial border; the dorsal pole is worn and rounded off; only one of the columns of cirrus sockets consists of four, but this appears to be due to the wear on the dorsal pole which extends basalward for a greater distance than usual, apparently due to the age of the specimen.

The distance from the radials to the first syzygy is 7.8 mm.; the diameter at the level of the first syzygy, beyond which point the arms are lost, is 1.5.5 mm.

8. *Psathyrometra parva* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 39, 1911, p. 562 (*Psathyrometra parva*).

9. *Psathyrometra minima* A. H. Clark.

A. H. CLARK. Notes from the Leyden Museum, vol. 34, 1912, p. 141 (*Psathyrometra minima*).

Stat. 48. 8° 4'.7 S., 118° 44'.3 E. Flores Sea. 2060 Metres. 1 Ex.

The centrodorsal is sharply conical, 1.8 mm. in diameter at the base and 1.6 mm. from the apex to the interradial border; somewhat irregular shallow grooves averaging about half as wide as the cirrus sockets separate the sides of the centrodorsal into five radial areas each of which contains two closely crowded columns of cirrus sockets usually of two each.

The radials project very slightly beyond the edge of the centrodorsal and are strongly produced in the interradial angles so that they entirely separate the bases of the IBr_1; the IBr_1 are about twice as broad as long, and are deeply incised by a rounded posterior projection from the axillary; the IBr_2 (axillaries) are rhombic with strongly concave sides, about as long as broad, the anterior angle strongly produced, and the centre of the proximal border produced into a rounded process incising the distal border of the IBr_1.

The three brachials preserved resemble those of such species as *Ps. congesta* but the synarthrial tubercles are scarcely developed.

The distance from the apex of the centrodorsal to the first syzygy is 5.5 mm.

10. *Psathyrometra gracillima* A. H. Clark.

A. H. CLARK. Proc. Biol. Soc. Washington, vol. 22, 1909, p. 149 (*Psathyrometra gracillima*.
—— Crinoids of the Indian Ocean, 1912, p. 236, fig. 44, p. 237 (*Psathyrometra gracillima*).

11. *Psathyrometra congesta* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 221 (*Psathyrometra congesta*.

12. *Psathyrometra inusitata* A. H. Clark.

A. H. Clark. Records of the Indian Museum, vol. 7, 1912, part 3, N° 26, p. 270 (nomen nudum; 7 miles S.E. by S. from Ross Island; 265 fathoms).
—— Notes from the Leyden Museum, vol. 34, 1912, p. 141 (*Psathyrometra inusitata*).

Stat. 38. 7° 35′.4 S., 117° 28′.6 E. Flores Sea. 521 Metres. 1 Ex.
Stat. 45. 7° 24′ S., 118° 15′.2 E. Flores Sea. 794 Metres. 1 Ex.
Stat. 178. 2° 40′ S., 128° 37′.5 E. Ceram Sea. 835 Metres. 1 Ex.
Stat. 314. 7° 36′ S., 117° 30′.8 E. Flores Sea. 694 Metres. 1 Ex.
Stat. 316. 7° 19′.4 S., 116° 49′.5 E. Flores Sea. 538 Metres. 2 Ex.

The centrodorsal is small and conical, the sides slightly, if at all, convex; the basal diameter is 3.2 mm., the distance from the apex to the interradial border 2.4 mm.; five very narrow bare areas divide the sides of the centrodorsal into five radial areas; these at the base are rarely half as broad as the adjacent cirrus sockets, and they are more or less encroached upon by the cirrus sockets on either side so that their course is usually more or less zigzag or irregular; they are scarcely to be recognized otherwise than that the outer columns of cirrus sockets in each radial area are slightly separated from the outer columns in the next area, whereas within each area all the columns are closely crowded.

Each radial area has three columns of cirrus sockets, the two outer of four each, the median of two only; the sockets are very closely crowded, the two outer columns coming into apposition just beyond the median; at the dorsal pole there are a number of pits representing obsolete cirrus sockets, some of which are situated in the interradial furrows; their arrangement appears to be in alternating rows instead of in columns.

No basal rays are visible.

The radials are even with the edge of the centrodorsal, but extend slightly upward in the angles of the calyx, where their tips are slightly separated. The IBr_1 are short, proximally nearly four times as broad as long in the median line, but decreasing in width distally where they are only about three times as broad as long in the median line; they are widely separated from their neighbors; the IBr_2 (axillaries) are rhombic, half again as broad as long, with the anterior angle produced; the lateral angles extend far beyond the distal lateral angles of the IBr_1 and meet those of their neighbors, forming large water pores; the synarthrial tubercle is only slightly indicated.

Fig. 13.
Lateral view of the centrodorsal and arm bases of a specimen of *Psathyrometra inusitata* from near the Postillon Islands. Enlarged. (Courtesy of the U. S. National Museum).

The first brachial is three times as long exteriorly as interiorly, half again as broad basally as the exterior length; the inner edges are entirely free and make approximately a right angle with those of the adjacent first brachials; the outer sides are in apposition with the outer sides of the first brachials on the adjacent rays. The second brachial is irregularly quadrate, the two of each arm pair in contact interiorly so that a water pore is formed similar to that between the ossicles of the IBr series. The first syzygial pair (formed of the third and fourth brachials is

slightly longer interiorly than exteriorly, about as broad as the interior length; the next four brachials are slightly wedge-shaped, twice as broad as the median length, the brachials then becoming more obliquely wedge-shaped. Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of usually four oblique muscular articulations; but the distal intersyzygial interval can only be estimated as the outer part of the arms in all the specimens is lost.

Though the animal is very small the IBr series and lower brachials are rugged, suggesting the condition so strongly developed in the large species of the genus.

P_1 is exceedingly slender and delicate, with the first segment broader than long, the next five about as long as broad, the seventh slightly longer than broad, and the succeeding becoming greatly elongated. P_2 is much stouter (? and longer) with the first four segments short but the following rapidly increasing in length and the outer exceedingly elongated.

From Stat. 38 there is a specimen smaller than the one described. The interradial bare areas on the centrodorsal are almost wholly obliterated; the arrangement of the cirrus sockets is less regular than described, the distribution in columns being more or less obscured.

The example from Stat. 45 is that described in detail above.

The individual from Stat. 178 is similar to that from Stat. 38, but very slightly smaller, and with the bare interradial areas on the centrodorsal slightly better marked.

A similar specimen was dredged at Stat. 314.

Two small specimens are from Stat. 316; several broken cirri remain; these are of the type characteristic of the genus; the longest is 19 mm. long with 21 segments of which the proximal are about four times as long as the expanded distal ends, and the outer about as long, but with unmodified distal ends; the cirri are slender, but not excessively so, and taper distally to a point.

The arrangement of the obsolete cirrus sockets about the tip of the centrodorsal in alternating rows rather than in columns is very interesting in indicating the possible course of development of the centrodorsal characteristic of the *Zenometrinae* through the type common to the other groups in the *Macrophreata*, especially of the *Bathymetrinae*.

The entirely smooth ossicles of the division series and brachials of the species of this genus, even of the smallest, are very characteristic.

13. *Psathyrometra antarctica* A. H. Clark.

A. H. Clark. Die Crinoiden der Antarktis, 1915, p. 116, pl. 2, figs. 1*a*, 1*b* (*Psathyrometra antarctica*).

14. *Psathyrometra anomala* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 143 (*Psathyrometra anomala*).

Stat. 211. 5°40′.7 S., 120°45′.5 E. Banda Sea. 1158 Metres. 1 Ex.

The centrodorsal is low, rounded conical, 1.7 mm. in diameter at the base and about 1.0 mm. from the apex of the dorsal pole to the interradial margin; there are twenty large

cirrus sockets, four in two closely crowded columns in each radial area, the columns in each radial area separated from those in the adjacent radial areas by narrow irregular lines.

The arm structure is as in *Ps. inusitata*; the arms were probably about 20 mm. long. P_2 bears a small genital gland.

15. *Psathyrometra* sp.

Stat. 38. 7° 35'.4 S., 117° 28'.6 E. Flores Sea. 521 Metres. Fragments.

Two arm fragments and an incomplete cirrus from Stat. 38 belong to a species near, if not, *Ps. major*. The incomplete cirrus is 24 mm. long and is composed of 18 segments.

Leptometra A. H. Clark.

Key to the Species of the Genus Leptometra.

a¹ Cirri very long and slender, gradually tapering to a point distally, all of the component segments being about twice as long as broad, the outer without any modification of the distal dorsal edge, so that the dorsal profile remains smooth; arms up to 150 mm. in length; cirri 50 mm. to 60 mm. long (Mediterranean and Aegean Seas; 54—1292 Metres). . . . . *phalangium*

a² Cirri proportionately shorter, without a distal taper and hence in the outer part appearing considerably stouter, composed in the proximal portion of segments which are about twice as long as broad, the distal segments becoming shorter, about as long as broad to, at most, one third again as long as broad, and having the distal dorsal edge somewhat swollen so that the dorsal profile of the cirri is slightly scalloped; arms up to 125 mm. in length; cirri 30 mm. to 40 mm. (usually 35 mm. to 40 mm.) long (from the western coast of Scotland, and Ireland, southward to Madeira; 45—450 Metres) *celtica*

Zenometra A. H. Clark.

The only species in the genus *Zenometra* is

1. *Zenometra columnaris* (P. H. Carpenter).

P. H. Carpenter. Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, p. 169, pl. 1, fig. 8 (*Antedon columnaris*).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 237 (*Zenometra pyramidalis*).

Hartlaub. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 406, pl. 8, fig. 13; pl. 10, figs. 6—14; pl. 15, fig. 9 (*Antedon columnaris*).

Sarametra A. H. Clark.

The only species in the genus *Sarametra* is

1. *Sarametra triserialis* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 219 (*Zenometra triserialis*).

Eumorphometra A. H. Clark.

Key to the Species of the Genus Eumorphometra.

a[1] Cirrus segments 20—25, of which the fourth-sixth are about twice as long as broad (shores of the Antarctic continent in the vicinity of Gaussberg; 380—400 Metres) . . . . . *concinna*

a[2] Cirrus segments 25—30, the longest only slightly longer than broad (near Marion Island, in 46° 43′ 00″ S., 38° 04′ 30″ E.; 252 Metres) . . . . . *hirsuta*

1. *Eumorphometra hirsuta* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 188, pl. 31, fig. 5 (*Antedon hirsuta*).
A. H. Clark. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 66 (*Thaumatometra hirsuta*).
—— Die Crinoiden der Antarktis, 1915, p. 118 (*Eumorphometra hirsuta*).

2. *Eumorphometra concinna* A. H. Clark.

A. H. Clark. Die Crinoiden der Antarktis, 1915, p. 118 (*Eumorphometra concinna*).

Balanometra A. H. Clark.

Key to the Species of the Genus Balanometra.

a[1] Centrodorsal very long, nearly three times as long as broad at the base; the two columns of cirrus sockets in each radial area are separated from those in the adjacent radial areas by shallow rounded furrows averaging about half as broad as the sockets; the two columns are separated from each other by a line rather less than half as broad as the furrows separating the pairs; 27—35 cirrus segments, of which the longest are four times as long as broad or even longer, and the terminal ten are as long as, or slightly longer than, broad (Philippine Islands; 140 Metres). . . . . *elongata*

a[2] Centrodorsal conical with slightly swollen sides, half again as long as broad at the base; the two columns of cirrus sockets in each radial area are separated from those in the adjacent radial areas by deep interradial furrows, and the two columns themselves are separated by a similar, but narrower and shallower furrow; 35—40 cirrus segments, of which the longest are not over three times as long as broad, and the outermost are all markedly longer than broad (Philippine Islands; 148 Metres). . . . . *balanoides*

1. *Balanometra elongata* (A. H. Clark).

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 229 (*Perometra elongata*).

2. *Balanometra balanoides* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 207, pl. 33, figs. 6, 7 (*Antedon balanoides*).
A. H. CLARK. Smithsonian Miscellaneous Collections vol. 61, 1913, N° 15, p. 57 (*Balanometra balanoides*).

Adelometra A. H. Clark.

Key to the Species of the Genus Adelometra.

a¹ Centrodorsal columnar; cirri XXV—XL, 60—70, 25 mm. long; longest cirrus segments less than twice as long as broad, with very slightly expanded distal ends; 14 arms; IIBr series usually 4 (3 + 4) (Kei Islands; 252 Metres) *angustiradia*

a² Centrodorsal rounded conical, about half again as long as broad at the base; cirri about XXX, 30—35, from 13 mm. to 18 mm. long; longest cirrus segments (fourth-tenth) about three times as long as the distal diameter, with expanded and funnel-shaped distal ends; 10 arms (off Havana, Cuba; 380 Metres) . . . . . *tenuipes*

1. *Adelometra angustiradia* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 253, pl. 45, fig. 4 (*Antedon angustiradia*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 57 (*Adelometra angustiradia*).

2. *Adelometra tenuipes* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 36, 1908, p. 236 (*Adelometra tenuipes*).

4th Subfamily Perometrinae A. H. Clark.

Key to the Genera of the Subfamily Perometrinae.

a¹ P_1 and P_a absent; size small, the 10 arms being from 25 mm. to 35 mm. (usually between 25 mm. and 30 mm.) in length; cirri XX—XXX, 22—25, 10 mm. long (West Indies; 59—433 Metres). . . . . **Hypalometra**

a² P_1 always present, though P_a (on the inner distal end of the first syzygial pair) is sometimes absent

b¹ ossicles of the IBr series and first two brachials with smooth and unmodified depressed borders, laterally in close apposition with their neighbors and sharply flattened against them; synarthrial tubercles (on the articulations between the elements of the IBr series and first two brachials) very prominent, sometimes extravagantly developed; P_1 is as long as, longer than, or shorter than, P_2; P_a may be absent; 10—14 (usually 10) arms

from 35 mm. to 90 mm. long 28—55 cirrus segments (from Madagascar to the Kei Islands and southern Japan; 70—252 [? 273] Metres). . . . . **Perometra**

b² the ossicles of the IBr series and first two brachials may be just in contact laterally, but their sides are never sharply flattened, and prominent synarthrial tubercles are never developed; their lateral borders always bear tubercles, one or many to each ossicle, and their distal and proximal borders are usually prominently everted and tubercular

c¹ interbrachial portions of the perisome naked; P_a always present (Kei Islands and southern Japan; 204—344 Metres) . . . . **Nanometra**

c² interbrachial portions of the perisome with numerous prominent rounded calcareous nodules which are not in lateral contact; P_a usually absent (Moluccas and southern Japan; 99—270 Metres). . . . **Erythrometra**

Perometra A. H. Clark.

Key to the Species of the Genus Perometra.

a¹ Centrodorsal rounded conical; cirri numerous, long and slender, XXX—XL, 35—55, 25 mm. to 30 mm. long; arms 50 mm. long, or longer

b¹ 11—14 arms 50 mm. long; IIBr series 2; synarthrial tubercles greatly, but not extravagantly, developed; all of the earlier pinnules present (Providence Island, northeast of Madagascar; 225 Metres) . . . . . *afra*

b² 10 arms 70 mm. to 90 mm. long; synarthrial tubercles extravagantly developed; P_a usually absent (southern Japan, from the Korean Straits to Sagami Bay; 70—250 [? 273] Metres) . . . . . *diomedeae*

a² Centrodorsal low hemispherical; cirri XV, 28; 10 arms 35 mm. long; all the earlier pinnules present (Kei Islands; 252 Metres). . . . . *pusilla*

1. *Perometra afra* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 40, 1911, p. 43 (*Perometra afra*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 57 (*Perometra afra*).

2. *Perometra diomedeae* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 146 (*Antedon diomedeae*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 316 (*Perometra diomedeae*).

3. *Perometra pusilla* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 131, pl. 23, fig. 1 (*Antedon pusilla*).
A. H. Clark. Proc. U. S. National Museum, vol. 39, 1911, p. 561 (*Perometra pusilla*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 58 (*Perometra pusilla*).

Erythrometra A. H. Clark.

Key to the Species of the Genus Erythrometra.

a^1 Cirri with 36—39 segments, 18 mm. long; arms 60 mm. long (Moluccas; 236 Metres). . . . . *australis*

a^2 Cirri with 30 segments, 11 mm. long; arms 35 mm. long (southern Japan; 99—270 Metres) . . . . . *ruber*

1. *Erythrometra australis* sp. nov.

"Albatross" Stat. 5617. Dodinga Bay, Gilolo. 236 Metres. 1 Ex.

The centrodorsal is hemispherical, the small bare dorsal pole covered with closely set rounded tubercles.

The cirri are about XXX, the long peripheral 18 mm. long with 36—39 segments, the short apical 4 mm. long with about 15 segments. In the long peripheral cirri the first two segments are more than twice as broad as long, the third is slightly broader than long, the fourth is from one third to one half again as long as broad, the fourth and fifth are about twice as long as broad, and the following gradually decrease in length to the fourteenth which is about as long as broad, and still further to the last dozen or so, which are about twice as broad as long; the longer earlier segments are rather strongly constricted centrally, with prominent ends; the distal dorsal border of the proximal segments is prominent; as the segments become shorter they gradually develop a prominent median carination the crest of which is convex in lateral view.

The radials extend slightly beyond the rim of the centrodorsal; their distal border is abruptly everted, smooth or more or less tubercular.

The IBr_1 are approximately oblong, between three and four times as broad as long, the proximal and distal edges prominently everted, the lateral edges bearing from four to six long blunt tubercles.

The IBr_2 (axillaries) are rhombic, not quite twice as broad as long, the proximal and distal edges everted, and the lateral angles produced into a ventrolateral process, or bearing two long blunt tubercles resembling those on the lateral borders of the IBr_1. Usually the sides of the IBr_1 diverge at an angle of about 60°, and the lateral angles of the axillaries nearly or quite meet above the gap thus formed.

The arms are about 60 mm. long.

The first brachials are short, twice as long exteriorly as interiorly, the median length approximately the same as the inner; the inner edges are in apposition, and the outer bear a rather broad thin ventrolateral process, and at the distal angle a tubercle; the proximal, and outer half of the distal, edges are thickened and everted.

The second brachials are irregularly quadrate, twice as broad as long, with the proximal border slightly everted; the proximal inner and outer angles usually bear a tubercle.

The first syzygial pair (composed of the third and fourth brachials) is slightly longer

interiorly and exteriorly, half again as broad as the median length; the next two brachials are roughly oblong, the following becoming triangular, about as long as broad, and after the basal third of the arm wedge-shaped, and elongate distally. The distal edge of the brachials is rather prominent and finely spinous; their dorsal surface is longitudinally striate.

Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of two oblique muscular articulations.

The interradial portions of the perisome of the disk bear numerous calcareous concretions subequal in size which, entirely and rather widely separated from each other, are elevated above the general surface in the shape of thick papillae.

P_1 is relatively large and stout, and recalls P_2 in certain varieties of *Oligometra serripinna*; it is 6 mm. long, composed of 12 segments of which the first is about as long as broad, and the remainder about half again as long as broad; the distal border on the outer side (away from the disk) is everted and finely spinous.

P_2 is 3 mm. long with 10 segments; it resembles P_1 but is proportionately smaller, and the outer segments have a greater development of spines.

P_3 is 3 mm. long with 10 segments, more slender than P_2, the component segments more elongate with more everted and spinous distal ends. The following pinnules resemble P_3, but slowly increase in length.

The distal pinnules are 7 mm. long, very slender, with 19 segments of which all but the first two are greatly elongated with swollen articulations and overlapping and spinous distal ends.

P_a is absent from seven arms, and present on three.

The colour in life is pale orange and yellow, according to a note by Mr F. M. CHAMBERLAIN.

The specimen described in Cat. N° 36050 U. S. National Museum.

2. *Erythrometra ruber* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 146 (*Antedon ruber*).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 316 (*Erythrometra ruber*).

Hypalometra A. H. Clark.

The only species in the genus *Hypalometra* is

1. *Hypalometra defecta* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, pp. 54, 206, 207, 367, 368, 378 (*Antedon defecta*).
HARTLAUB. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 381, pl. 6, figs 1—4; pl. 14, fig. 11 (*Antedon defecta*).

Nanometra A. H. Clark.

Key to the Species of the Genus Nanometra.

a[1] Cirri LXX, 43—47, 25 mm. to 30 mm. long; distal borders of the radials and borders of the ossicles of the IBr series usually unmodified, rarely bearing tubercles;

P_1 has 20 segments; P_2 is slightly shorter with 17 segments; arms 120 mm. long (Kei Islands and Moluccas; 204—567 Metres) . . . . . *clymene*

a² Cirri XXX—XL, 30—45 (usually 35—40), 13 mm. to 15 mm. long; distal borders of the radials and borders of the ossicles of the IBr series and lower brachials prominently everted and finely tubercular or spinous; P_1 has 8—10 segments; P_2 is slightly shorter; arms 40 mm. to 50 mm. long (southern Japan; 250 [? 185]—344 Metres) . . . . . *bowersi*

1. *Nanometra clymene* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 143 (*Nanometra clymene*).

Stat. 173. 3°27′.0 S., 131°0′,5 E. Ceram Sea. 567 Metres. 1 Ex.
Stat. 251. 5°28′.4 S., 132°0′.2 E. Arafura Sea. 204 Metres. 4 Ex.
Stat. 253. 5°48′.2 S., 132°13′ E. Arafura Sea. 304 Metres. 1 Ex.
Stat. 254. 5°40′ S., 132°26′ E. Arafura Sea. 310 Metres. 1 Ex.

The centrodorsal is long, rounded conical, about 3.5 mm. in diameter at the base and about 3.0 mm. from the apex to the interradial margin; the dorsal pole is 2.0 mm. in diameter, slightly concave; the cirrus sockets are arranged in four or five closely crowded regularly alternating rows, or four closely crowded alternating columns, in each radial area.

The cirri are about LXX, 43—47, 25 mm. to 30 mm. long, moderately slender; the first segment is very short, the second about twice as broad as long or even somewhat broader, the third nearly as long as broad, the fourth about one third again as long as broad, the sixth-eleventh or -twelfth about twice as long as broad; the following gradually decrease in length so that the last ten or eleven before the penultimate are twice as broad as long; on the fourth and following the distal dorsal edge projects slightly, this on the short outer segments becoming a prominent median carination with a convex crest occupying the entire dorsal surface of the segment.

The ends of the basal rays are visible as rather prominent rounded triangular areas in the angles of the calyx.

The radials are rather prominent, and are nearly as long in the median line as laterally; the plane of their mid-dorsal line is nearly 90° divergent from the dorsoventral axis.

The IBr_1 are four times as broad as long in the median line; the lateral edges are from one third to one half again as long as the median length, strongly convergent, continuing in the same direction as the lateral portion of the distal border of the radials on either side; the median third of the proximal border is slightly convex; the distal border is deeply incised by a posterior rounded projection from the axillary; the distal half of the lateral borders is produced in the form of a prominent tubercular process.

The IBr_2 (axillaries) are about as broad as long, the anterior angle slightly produced, the anterior sides making approximately a right angle with each other; a strong rounded posterior process extends to about the same distance below the line passing through the two lateral angles that the anterior angle reaches above it; just below the lateral angles there is a prominent tubercular process; the distal edges, like the lateral portions of the distal edge

of the IBr_1, are bordered with exceedingly fine spines. The synarthrial tubercles, though broadly rounded, are rather prominent.

The first brachial is short, three times as long exteriorly as interiorly, slightly longer in the median line than interiorly; the interior edges are in apposition; the exterior edges are slightly concave; the distal inner corners bear a rudimentary tubercle similar to that on the outer part of the lateral borders of the IBr_1. These tubercles on the IBr_1, with the adjacent tubercles under the lateral angles of the axillaries, almost completely close what otherwise would be a large rhombic water pore.

The second brachial is much larger than the first, in direct dorsal view almost an equilateral triangle; the outer border is slightly concave; the distal edge is very finely spinous.

The first syzygial pair (composed of the third and fourth brachials) is slightly longer interiorly than exteriorly, about twice as broad as long in the median line, the sides slightly concave, the distal edge very finely spinous. The following brachials rapidly become obliquely wedge-shaped, after the second syzygy triangular and as long as broad with very finely spinous edges, and later obliquely wedge-shaped again.

Syzygies occur between the third and fourth, ninth and tenth and fourteenth and fifteenth brachials, and distally at intervals of four (more rarely three) oblique muscular articulations.

The brachials have projecting and overlapping finely spinous distal edges, and the dorsal surface is marked with fine parallel longitudinal ridges. The arms are 120 mm. long.

P_1 is from 12 mm. to 13 mm. long, composed of 20 segments of which the first is slightly longer than broad, the second is about half again as long as broad, the third is about twice as long as the proximal length, and the fourth and following are about two and one half times as long as broad; P_1 is the longest pinnule on the arm, though only slightly longer than the distal pinnules; it is smooth with long segments, rather stiff and moderately stout, tapering moderately in the proximal third, more gradually from that point onward; in its general appearance, especially in the very close union of its segments which have perfectly straight ends, it recalls P_1 in the larger species of *Psathyrometra*.

P_2 is from 10.0 mm. to 10.5 mm. long with 17 segments, similar to P_1 but tapering rather more evenly.

P_3 is 8 mm. long with 13 or 14 segments, similar to P_1 and P_2, but with the segments more enlarged distally and proportionately smaller.

P_4 is 5.5 mm. long with 12 or 13 segments, similar to P_3, but with the distal segments slightly more elongated.

P_5 is 5.5 mm. long, resembling the preceding pinnule but more slender, with 12 or 13 segments of which the distal are more elongated.

P_6 is 7 mm. long with 15 segments, longer, less slender and less stiff than those preceding, the distal segments with very slightly spinous edges. The following pinnules are similar to P_6.

The distal pinnules are exceedingly slender, 11 mm. long with 23 segments of which the first two are unusually enlarged and the following are moderately elongate with swollen articulations and finely spinous ends.

The specimen described is that from Stat. 253.

The example from Stat. 173 is slightly smaller than the one just described, with the axillaries and brachials proportionately slightly longer.

One of the individuals from Stat. 251 has the centrodorsal hemispherical, the base slightly elongated, the distal border of the radials prominently everted and broken up into five or six large rounded bead-like tubercles of which the central one is rather larger than the others, and similar tubercles along the lateral borders of the IBr_1 and the outer thirds of the contiguous borders of the IBr_1 and IBr_2. The others, which are smaller, have conical centrodorsals, and plain and unmodified IBr series and lower brachials; owing to the non-development of tubercles on the distal angles of the IBr_1 and beneath the lateral angles of the axillaries there are large water pores between the IBr series.

The specimens from Stat. 254 resemble the smaller individuals from Stat. 251.

2. *Nanometra bowersi* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 144 (*Antedon minor*; name preoccupied); p. 148 (*Antedon bowersi*).
—— Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 50, 1907, part 3, p. 341 (*Antedon orientalis*); p. 349 (*Nanometra minckerti*; new name for *Antedon minor*, preoccupied).
—— Proc. U. S. National Museum, vol. 34, 1908, p. 318 (*Nanometra bowersi*; here considered as including *Antedon minor* and *Antedon orientalis*).

5th Subfamily Isometrinae A. H. Clark.

The only genus in this subfamily is *Isometra*, of which a complete account will be found in "Die Crinoiden der Antarktis", pp. 145—146 [1]).

6th Subfamily Heliometrinae A. H. Clark.

Key to the Genera of the Subfamily Heliometrinae.

a¹ 10 radials and 20 arms (coasts of the Antarctic continent, and Kerguelen Island; 18—400 Metres) . . . . . **Promachocrinus**

a² 5 radials and 10 arms

b¹ each brachial bears a high median carinate process; P_1 much longer than P_2 (coasts of the Antarctic continent; 223—400 [?900] Metres) . . . . . **Anthometra**

b² no carinate processes on the brachials

c¹ brachials very short, much broader than long; middle and distal pinnules with very short segments which are rarely longer than broad; cirrus segments very short, only very few, or none at all longer than broad; P_1 and P_2 of approximately the same length (vicinity of Heard Island, and the winter quarters of the "Discovery"; 135—270 Metres) . . . . . **Solanometra**

1) Deutsche Südpolar-Expedition, vol. 16 (Zoologie, vol. 8), May 16, 1915.

c² brachials longer, about as long as broad or slightly longer than broad; segments of the middle and distal pinnules longer than broad, usually very much so; a number of the earlier cirrus segments longer than broad

d¹ P_1 with 30—45 segments of which those beyond the seventh to eleventh are longer than broad, the distal elongate, though never much more than twice as long as broad; P_2 is similar to P_1, but shorter (Arabian Sea to southwestern Japan; 192—2160 Metres) . . . . . **Cyclometra**

d² P_1 with 50—100 segments of which only the terminal are longer than broad, and those only very slightly so; P_2 is similar to P_1, and usually of about the same length

e¹ brachials with smooth distal edges; ossicles of the division series with smooth borders and a smooth dorsal surface; no rudimentary terminal comb on the proximal pinnules (Arctic Ocean, and southward to Norway and Nova Scotia; western shores of the Okhotsk and Japanese Seas from Cape Terpenia to Korea; 12—1340 Metres) . . . . . **Heliometra**

e² brachials with spinous distal edges; ossicles of the division series with usually spinous borders and commonly with a greater or lesser development of spines on the dorsal surface; the proximal pinnules bear a rudimentary terminal comb suggesting that found in the species of the Comasteridae (from Cape Horn northward along the western coast of South and North America to Alaska, thence westward and southward to southern Japan; 11—1911 Metres) . . . . . **Florometra**

The genus *Heliometra* includes only the well known *Heliometra glacialis* (Leach) (= *Antedon eschrichti* [J. Müller] of P. H. Carpenter and earlier authors generally).

Anthometra, *Solanometra* and *Florometra* are best considered as subgenera of *Promachocrinus*. A full account of the first two and the last will be found in my memoir on "Die Crinoiden der Antarktis" [1]).

Florometra A. H. Clark.

Key to the Species of the Genus Florometra.

a¹ Third syzygy between the 14th and 15th brachials

b¹ third syzygy between the 14th and 15th brachials with very rare exceptions;

1) Deutsche Südpolar-Expedition, vol. 16 (Zoologie, vol. 8), May 16, 1915, pp. 120—143.

dorsal surface and borders of the ossicles of the IBr series and lower brachials smooth; synarthrial and articular tubercles more or less prominent, especially in large specimens, giving the arm bases a rugged appearance; arms from 225 mm. to 230 mm. in length

c¹ more slender; synarthrial and articular tubercles moderately developed; P_6 as long as P_1, the intermediate pinnules longer (Bering Sea and the westernmost Aleutian Islands to the Gulf of Alaska, and southward to Monterey Bay, California; 77—1911 Metres) . . . . . *asperrima*

c² stouter; synarthrial and articular tubercles strongly developed; P_1, P_2 and P_3 of equal length; P_4 slightly, P_5 much shorter (eastern coast of Japan, from Yezo Strait southward to Linschoten Strait, between Shikoku and Hondo; 959 [?540] to 1056 Metres) . . . . . *laodice*

b² third syzygy rarely between the 14th and 15th brachials, usually between the 15th and 16th or 16th and 17th; borders of the ossicles of the IBr series and lower brachials prominently spinous, and a greater or lesser development of spines on their dorsal surface, particularly in the lateral portions; lower segments of the proximal pinnules strongly carinate, the carinate processes spinous; synarthrial and articular tubercles undeveloped; arms from 140 mm. to 175 mm. long (eastern coast of Japan, from Sendai southward to Sagami Bay; 126—606 Metres) . . . . . *mariae*

a² Third syzygy between the 16th and 17th brachials

b¹ small, the arm being not over 125 mm., and usually not over 100 mm. in length; ossicles of the IBr series and first two brachials with finely spinous borders, and with a single, rarely more, prominent spine near the outer borders, more rarely also with a few spines scattered over the dorsal surface (from southern California southward to Panamá Bay; 102—711 Metres) . . . . . *tanneri*

b² larger, the arms being usually about 150 mm. long, and often longer

c¹ ossicles of the IBr series and lower brachials entirely devoid of spines on the dorsal surface, and without spinous borders

d¹ proximal pinnules not swollen basally, P_1 and P_2 being extremely slender throughout their entire length, their basal segments with the distal angles deeply truncated so that the dorsal border is narrowed to a slightly rounded point usually crowned with a few spinelets (from southeastern Alaska southward to Panamá; 11——1407 Metres) . . . . . *perplexa*

d² P_1 to P_4 distinctly swollen in the first five or six segments, noticeably more slender beyond; basal segments with their distal angles but slightly truncated, so that the distal border is relatively long and

straight, parallel to the longitudinal axis of the pinnule[1]) (west coast of Tierra del Fuego and southwestern Chile and the adjacent islands from Navarin Island northward to Tom Bay, in 50°08′30″S., 74°41′00″W.; 22—326 Metres) *magellanica*

c² ossicles of the IBr series and first two brachials with spinous borders, and with a greater or lesser development of spines on the dorsal surface

d¹ P_1 to P_4 distinctly swollen in the first five or six segments, noticeably more slender beyond; basal segments with their distal angles but slightly truncated, so that their distal border is relatively long and straight, parallel to the longitudinal axis of the pinnule; spines on the ossicles of the IBr series and first two brachials never very numerous nor long (west coast of Tierra del Fuego and southwestern Chile and the adjacent islands, from Navarin Island northward to Tom Bay, Patagonia; 22—326 Metres) . . . . . *magellanica*

d² proximal pinnules not swollen basally, P_1 and P_2 being extremely slender throughout their entire length, their basal segments usually with the distal angles deeply truncated so that the dorsal border is narrowed to a slightly rounded point which as a rule is crowned with a few spinelets; sometimes these segments have a very spinous carinate process

e¹ third syzygy almost invariably between the 16th and 17th brachials; ossicles of the IBr series and lower brachials very spiny (Puget Sound to southern California; 27—357 Metres) . . . *serratissima*

e² position of the third syzygy variable, between the 14th and 15th, 15th and 16th or 16th and 17th brachials; spinosity of the ossicles of the IBr series and lower brachials moderately developed (eastern coast of Japan, from Sendai southward to Sagami Bay; 126—606 Metres) . . . . . *mariae*

1. *Florometra magellanica* (Bell).

BELL. Proc. Zoöl. Soc. London, 1882, p. 651, text fig. B (*Antedon eschrichti* var. *magellanica*).
CHIERCHIA. Revista marittima, vol. 18, 1885, p. 9 (*Comatula* sp.).
P. H. CARPENTER. Bijdragen tot de Dierkunde, Afl. 13, 1886, p. 4 (*Antedon magellanica*).
—— "Challenger" Reports. Comatulae, 1888, pp. 138, 149, 376 (*Antedon magellanica*); p. 148, pl. 12, figs. 1, 2; pl. 24, figs. 1—3 (*Antedon rhomboidea*).
HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N° 4, p. 139, (*Antedon rhomboidea*, part; specimen collected by Dr REHBERG in Smyth's Channel, but no those from Panamá).
LUDWIG. Hamburger Magalhaensische Sammelreise, Lief. 4, 1899, Crinoiden, p. 1 (*Antedon rhomboidea*).

1) See the "Challenger" report, pl. 24, figs. 1, 2 and 3; this feature is even more marked in specimens at hand from Cape Horn. Pl. 12, fig. 2, shows a pinnule almost of the *perplexa* type.

A. H. CLARK. Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 257, fig. 2, p. 258 (*Heliometra magellanica*).
—— Smithsonian Miscellaneous Collections, vol. 60, 1912, N° 10, pp. 3, 32 (*Solanometra magellanica*).
—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 62 (*Florometra magellanica*).
—— Bull. de l'Institut océanographique, Monaco, N° 285, 1914, p. 3, footnote (*Antedon magellanica*; referred to *Florometra*).
—— Die Crinoiden der Antarktis, 1915, p. 142, pl. 8, figs. 1—5 (*Promachocrinus* [*Florometra*] *magellanica*).

2. *Florometra perplexa* (A. H. Clark).

A. AGASSIZ. Bull. Mus. Comp. Zoöl., vol. 21, 1891, N° 4, p. 197 (*Comatula* sp.).
HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N° 4, p. 139 (*Antedon rhomboidea*, part; specimens from Panamá, but not that collected by Dr REHBERG in Smyth's Channel).
A. H. CLARK. Proc. U. S. National Muséum, vol. 33, 1907, p. 74 (*Antedon perplexa*).
A. H. CLARK. Bull. Mus. Comp. Zoöl., vol. 51, 1908, N° 8, p. 238 (*Heliometra rhomboidea*).

3. *Florometra serratissima* (A. H. Clark).

RITTER. Science (N. S.), vol. 15, 1902, N° 367, p. 62 (*Antedon rosacea*).
A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 77 (*Antedon serratissima*).

4. *Florometra tanneri* (Hartlaub).

HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N° 4, p. 141, pl. 1, fig. 9; pl. 2, fig. 13; pl. 3, figs. 20, 22 (*Antedon tanneri*).

5. *Florometra mariae* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 77 (*Antedon mariae*); p. 78 (*Antedon hondoensis*).
—— Die Crinoiden der Antarktis, 1915, p. 142 (*Florometra mariae*; record of a specimen collected by Professor DOFLEIN).

6. *Florometra asperrima* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 73 (*Antedon asperrima*); p. 75 (*Antedon inexpectata*).

7. *Florometra laodice* (A. H. Clark).

A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 75 (*Antedon laodice*); p. 76 (*Antedon rathbuni*).

As in the case of many other echinoderm gènera inhabiting the north Pacific which as generic units are well circumscribed, the delimitation of the several species of *Florometra* presents extraordinary and unusual difficulties. Although the material at hand, consisting of about 1500 specimens from throughout the range of the genus, would be considered ample in the case of most types, in this case it merely increases the confusion.

Florometra magellanica seems to be a distinct form, confined to southern South America.

Florometra laodice may be the same as *F. asperrima*, though occurring on the opposite shore of the Pacific.

Some specimens from the Gulf of Alaska seem to be referable to *Florometra mariae* rather than to *F. serratissima*; and it is possible that the latter, which is probably only a spinous form of *F. perplexa* anyway, will eventually prove to be a synonym of *mariae*.

Florometra tanneri, though it appears to be distinct, may be the young of *F. perplexa*, or of *F. serratissima*, or of both forms.

Cyclometra A. H. Clark.

Key to the Species of the Genus Cyclometra.

a[1] Larger; cirri XXVII, 41—43, 30 mm. long; arms 130 mm. long; P_1 17 mm. to 19 mm. long, with 42—45 segments (northwest of Socotra, in 14° 20′ N., 52° 30′ E.; 2160 Metres) . . . . . *flavescens*

a[2] Smaller; cirri XL—L, 25—30, 17 mm. long; arms 55 mm. long; P_1 10 mm. long, with about 30 segments (southwestern Japan; 192 Metres) . . . *clio*

1. *Cyclometra flavescens* A. H. Clark.

A. H. Clark. Proc. Biol. Soc. Washington, vol. 24, 1911, p. 87 (*Cyclometra flavescens*).
—— Crinoids of the Indian Ocean, 1912, p. 239 (*Cyclometra flavescens*).

2. *Cyclometra clio* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 79 (*Antedon clio*).

7th Subfamily Bathymetrinae A. H. Clark.

Key to the Genera of the Subfamily Bathymetrinae.

a[1] All the cirrus segments short, the longest not so much as twice as long as the median diameter

b[1] cirrus segments cylindrical, without expanded distal ends, 25—33 (usually nearer the latter) in number, the longest (third-fifth) about one third again as long as broad, those beyond the eighth about as long as broad, the distal slightly broader than long; IBr series and arm bases without lateral processes, and widely free laterally (western coast of Ireland; 698 Metres) . . . . . **Orthometra**

b[2] cirrus segments with much swollen distal ends, not more than 20 in number; IBr series and brachials in close lateral contact (Moluccas to Marion Island, southeast of Africa; 1089—2880 Metres) **Tonrometra**

a[2] Proximal cirrus segments elongated, at least twice as long as the median diameter, and usually much longer

b^1 centrodorsal sharply conical with straight sides, nearly or quite as long as broad at the base . . . . . **Fariometra**

b^2 centrodorsal less sharply conical, with rounded sides, or hemispherical, and lower

c^1 all the brachials have strongly produced and very spinous edges; P_1 very slender and delicate, markedly longer than P_2, with the outer segments very greatly elongated with overlapping and spinous distal ends (from southern Japan, the Hawaiian and Philippine Islands westward to Cape Comorin, thence southwestward to between Marion Island and the Crozets; from the Bay of Biscay northward to 54° 17′ N. lat., and from Brazil northward to the Newfoundland banks; 248—2926 Metres). . . . . **Trichometra**

c^2 the brachials do not have strongly produced and very spinous distal ends; at most the distal edges of the outer brachials are bordered with fine spines

d^1 P_1 much elongated, between two and three times as long as P_2, composed of 30—40 segments of which a few of the basal are short, the following becoming slender and greatly elongated (Arctic Ocean from western Greenland to the Kara Sea, and southward to Portugal and Chesapeake Bay, and also in the vicinity of Marion Island, southeast of South Africa; 18—1800 Metres) . . . . **Hathrometra**

d^2 P_1 the same length as, longer than, or shorter than, P_2; but if longer never more than slightly so, and with not more than 20 segments

e^1 cirri with 20—30 relatively short segments of which the last six to thirteen are only very slightly, if at all, longer than broad

f^1 pinnules not especially long; distal pinnules the same length as the proximal pinnules; P_2 resembling P_3 and the following pinnules, slightly longer and stouter than P_1 with somewhat fewer segments which are proportionately longer; P_2 may bear a gonad, though these usually begin on P_3; arms 25 mm. to 60 mm. long; cirri L—LX, 21—30 (Kei and Meangis Islands, and southern Celebes; 204—1158 Metres) . . . . . **Nepiometra**

f^2 pinnules very long; distal pinnules not so long as the proximal pinnules; P_2 very slightly shorter than P_1 but similar to it, with about 18 elongated segments; following pinnules similar; arms about 20 mm. long; cirri about

XXX, 20—25 (southeastern South America; 1080 Metres) . . . . . **Phrixometra**

e^2 cirri with not more than 20 much elongated segments all of which are markedly longer than broad, especially the proximal

f^1 more than XXV cirri, which have 10—20 segments (eastern Pacific, including the Seas of Okhotsk and Japan, from western Bering Sea to the Kermadec Islands and New Zealand, and westward to between Marion Island and the Crozets; southwest of Iceland; 144—3178 Metres) . . . **Thaumatometra**

f^2 not more than XV cirri, which have not more than 10 segments (abysses of the Pacific from west of Tasmania to west of Japan; 4680—5220 Metres) **Bathymetra**

Hathrometra A. H. Clark.

The following described species are referable to the genus *Hathrometra*:

Asterias tenella Retzius, 1783.
Alecto dentata Say, 1825 (probably a synonym of *tenella*).
Alecto sarsii Düben and Koren, 1846.
Antedon prolixa Sladen, 1881.
Antedon hystrix P. H. Carpenter, 1884 (= *prolixa*).
Antedon exigua P. H. Carpenter, 1888.
Hathrometra norvegica A. H. Clark, 1913.

Trichometra A. H. Clark.

Key to the Species of the Genus Trichometra.

a^1 Over 40 cirrus segments; cirri XL—LX, 40—45, 20 mm. long, the last 15—20 segments about as long as broad; arms 60 mm. to 65 mm. long; IBr series and lower brachials narrow, entirely free laterally; rounded ventrolateral processes may be developed on the elements of the IBr series and first brachials, but these do not meet across the interradial areas (Hawaiian Islands; 248—639 Metres) . . . . . *vexator*

a^2 Less than 35 cirrus segments

b^1 more than 25 (25—33; usually 27—30) cirrus segments of which those beyond the twelfth to twentieth are about as long as broad

c^1 ossicles of the IBr series and first two brachials only slightly convex dorsally and sharply and broadly flattened against their neighbors; arms 45 mm. to 65 mm. long; cirri with 25—30 segments, 15 mm. to 22 mm. long; P_1 with 20—25 segments, 6 mm. long; P_2 with 10 segments,

4 mm. long (from the eastern part of the Gulf of Mexico and northern Cuba northward along the eastern coast of North America to the fishing banks of Newfoundland; 223—1219 Metres) . . . . . *cubensis*

c^2 ossicles of the IBr series and first two brachials strongly convex dorsally and laterally, just in lateral contact with their neighbors but not flattened against them; arms 37 mm. long; cirri with 27—33 segments; P_1 with 21—23 segments; P_2 with 13 segments, half as long as P_1 (from the Bay of Biscay northward to the western coast of Ireland [53° 58′ N., 12° 24′ W.]; 687—2030 Metres) . . . . . *delicata*

b^2 not more than 20 cirrus segments of which the distalmost are (slightly or considerably) longer than broad

c^1 20 cirrus segments of which the longest is a little more than twice as long as broad, and the distal are only slightly longer than broad; P_1 7 mm. long with 20 segments of which the basal three or four are short, the distal elongated; P_2 shorter, with 12 segments of which the basal four are short; distal pinnules 9 mm. long; arms 65 mm. long; cirri 10 mm. long (southwestern Japan; "Korea"; 650 Metres) . . *isis*

c^2 12—15 cirrus segments which are greatly elongated, the antepenultimate being over three times as long as its proximal diameter and the penultimate about twice as long as broad; P_1 very slender and filiform, with the first three segments about as long as broad; P_3 and following with a gonad; arms 13 mm. long; cirri 4 mm. long (coast of Brazil; 1472 Metres). . . . . *minutissima*

1. *Trichometra vexator* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 217 (*Trichometra vexator*).

2. *Trichometra cubensis* (Pourtalès).

Pourtalès. Bull. Mus. Comp. Zoöl., vol. 1, 1869, N° 11, p. 356 (*Antedon cubensis*, part; of the two specimens here described the larger is the type of this species, the smaller of *Atelecrinus cubensis* P. H. Carpenter [= *Atelecrinus balanoides*]).

P. H. Carpenter. Bull. Mus. Comp. Zoöl., vol. 9, 1881, N° 4, p. 165 (*Antedon cubensis*).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 229 (*Trichometra aspera*).

—— Fisheries, Ireland, Sci. Invest. 1912, N° 4, p. 3 (North American species of *Trichometra* most closely related to *T. hibernica*).

Hartlaub. Memoirs Mus. Comp. Zoöl., vol. 27, 1912, N° 4, p. 385 (part), pl. 9, figs. 10—12 (but not fig. 13); pl. 15, fig. 3 (but not fig. 4) (*Antedon cubensis*; fig. 13, pl. 9, and fig. 4, pl. 15, represent *Coccometra nigrolineata*).

The following reference refers to *Atelecrinus balanoides*:

Pourtalès. Bull. Mus. Comp. Zoöl., vol. 5, 1879, N° 9, pp. 214, 215 (*Antedon cubensis*).

Specimens are at hand from the following localities:

Gulf of Mexico (28° 41′ 00″ N. lat., 86° 07′ 00″ W. long.); 304 Metres ("Albatross" Stat. 2400; Cat. N° 16910 U. S. National Museum).
Between Savannah, Georgia, and Cape Charles (30° 44′ 00″ N. lat., 79° 26′ 00″ W. long.); 767 Metres ("Albatross" Stat. 2415; Cat. N° 34608 U. S. National Museum).
Between the Bahamas and Cape Fear, South Carolina (29° 16′ 30″ N. lat., 79° 36′ 30″ W. long.); 788 Metres ("Albatross" Stat. 2661; Cat. N° 14701 U. S. National Museum).
Between the Bahamas and Cape Fear (29° 39′ 00″ N. lat., 79° 49′ 00″ W. long.); 758 Metres ("Albatross" Stat. 2663; Cat. N° 14700 and 14711 U. S. National Museum).
Between the Bahamas and Cape Fear (30° 47′ 30″ N. lat., 79° 49′ 00″ W. long.); 486 Metres ("Albatross" Stat. 2666; Cat. N° 14703 and 22678 U. S. National Museum).
Between the Bahamas and Cape Fear (30° 58′ 30″ N. lat., 79° 38′ 30″ W. long.); 529 Metres ("Albatross" Stat. 2668; Cat. N° 14697 and 34636 U. S. National Museum).
Between the Bahamas and Cape Fear (31° 09′ 00″ N. lat., 79° 33′ 30″ W. long.); 634 Metres ("Albatross" Stat. 2669; Cat. N° 36286 U. S. National Museum).
South of Cape Sable, Nova Scotia (41° 47′ 00″ N. lat., 65° 37′ 30″ W. long.); 1219 Metres ("Albatross" Stat. 2528; Cat. N° 24085 U. S. National Museum).
South of Sable Island (43° 16′ N. lat., 60° 35′ W. long.); 630 Metres (Cat. N° 35891 U. S. National Museum).
Southwestern part of Banquereau Bank; 540 Metres (Cat. N° 35890 U. S. National Museum).
Banquereau Bank; 450 Metres (Cat. N° 35892 U. S. National Museum).
Fishing Banks (Cat. N° 35889 U. S. National Museum).

3. *Trichometra delicata* A. H. Clark.

A. H. Clark. Bull. du Mus. d'hist. nat., Paris, 1911, N° 4, p. 258 (*Trichometra delicata*).
—— Fisheries, Ireland, Sci. Invest., 1912, N° 4, p. 3 (*Trichometra delicata*).

4. *Trichometra isis* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 33, 1907, p. 82 (*Antedon isis*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 191 (*Thaumatometra isis*).

5. *Trichometra minutissima* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 233 (*Bathymetra minutissima*).

Fariometra A. H. Clark.

Key to the Species of the Genus Fariometra.

a^1 Centrodorsal sharply conical with straight sides, nearly or quite as long as broad at the base
  b^1 second brachial longer than broad; centrodorsal 3.5 mm. in diameter at the base (north of northeastern Celebes; 1901 Metres) . . . . . *scutifera*
  b^2 second brachial broader than long
    c^1 distal angles of the IBr_1 broadly rounded off and the lateral angles of the axillaries produced beyond them, forming large rhombic water pores between

the IBr series; similar conspicuous pores occur on the line of the articulation between the first and second brachials (west of Celebes; 724 Metres) *dione*

c^2 ossicles of the division series and first two brachials in close lateral contact throughout, in small specimens through ventrolateral processes; distal angles of the IBr_1 slightly produced, overlapping the proximal portion of the lateral angles of the axillaries; lateral edges of the first brachials sharply and broadly flattened; cirri with 25—28 segments of which the longest are from two to three times as long as the diameter of the much expanded and overlapping distal ends, and the last seven to ten are about as long as broad; arms about 50 mm. long (Philippine Islands; 509—1314 Metres) . . . . . *explicata*

1. *Fariometra scutifera* sp. nov.

Stat. 119. 1°33'.5 N., 124°41' E. Celebes Sea. 1901 Metres. 2 Ex.

The centrodorsal is sharply conical with straight sides, 3.5 mm. in diameter at the base and 3.0 mm. from the apex to the interradial border, thickly covered with very numerous cirrus sockets.

The distal border of the radials is even with the rim of the centrodorsal in the median line, and is slightly produced — very much less than in most species — in the interradial angles; the distal angles are slightly separated.

The IBr_1 are very short, eight to ten times as broad as the median length, the proximal border parallel with the curved distal border of the radials, the distal border on either side of the median line convex, nearly parallel with the concave proximal sides of the axillaries. In direct lateral view (viewed at right angles to the dorsoventral axis) the IBr_1 appear almost or quite bisected by the posterior process from the axillary. The bases of the IBr_1 are widely free laterally.

The IBr_2 (axillaries) are about as broad as long with the anterior angle considerably produced; the lateral angles project somewhat beyond the distal angles of the IBr_1 so that narrow elongate water pores are formed. Neither the IBr_1 nor the axillaries have ventrolateral processes.

The first brachials are extremely short in the median line, very slightly longer in median length, but becoming four to five times as long externally; their inner sides diverge at approximately a right angle.

The second brachials are longer than broad, rather sharply convex dorsally, with the proximal sides rather strongly concave so that a relatively long and narrow process incises the first brachials.

The arms are all broken at the syzygy between the third and fourth brachials. The eversion of the distal edges of the brachials and the development of spines along these edges are almost obsolete.

In a smaller specimen the centrodorsal is sharply conical, slightly higher than broad at

the base; the axillaries are longer than broad with a strongly produced distal angle and an equally long, but broader, posterior process which rises into a faint rounded median carination; the second brachials are much longer than broad with a faint median carination running their entire length; and the following brachials are slightly raised in the mid-dorsal line, the raised portion bearing very numerous very fine spines.

2. *Fariometra explicata* (A. H. Clark).

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, 1908, part 2, p. 232 (*Trichometra explicata*).
—— Crinoids of the Indian Ocean, 1912, p. 239 (*Trichometra explicata*).

Specimens are at hand from the following localities:

Eastern coast of Mindoro, Philippines, in 509 Metres ("Albatross" Stat. 5123; Cat. N° 25425 U. S. National Museum).
Verde Island Passage, Philippines, in 612 Metres ("Albatross" Stat. 5115; Cat. N° 36014 U. S. National Museum).
Palawan Passage, Philippines, in 1314 Metres ("Albatross" Stat. 5349; Cat. N° 36043 U. S. National Museum).

3. *Fariometra dione* sp. nov.

Stat. 85. 0° 36'.5 S., 119° 29'.5 E. Makassar Straits. 724 Metres. 1 Ex.

The centrodorsal is conical, the sides practically straight, 2.6 mm. in diameter at the base and 2.6 mm. from the apex to the interradial border, and is closely set with about one hundred cirrus sockets of which about one half appear to be of full size.

The radials are just visible beyond the rim of the centrodorsal in the median line, but extend well up in the angles of the calyx; their distal angles are slightly separated.

Viewed perpendicularly to the plane of their dorsal surface the IBr_1 are very short and band-like, five to six times as broad as long, the proximal and distal borders parallel, the distal angles broadly rounded off and finely spinous. If the animal is viewed at right angles to the dorsoventral axis the IBr_1 are seen to be very strongly convex dorsally and, since the plane of their mid-dorsal line is at right angles to that of the dorsoventral axis, they appear to be bisected by the posterior process of the axillaries.

The IBr_2 (axillaries) are about as broad as long with very strongly concave sides; as a result of the broad rounding off of the distal angles of the IBr_1 their lateral angles, the proximal borders of which are horizontal, overhang for a very considerable distance the distal corners of the IBr_1 so that large rhombic water pores are formed between the IBr series. There are no ventrolateral processes on the elements of the IBr series, or on the first two brachials.

The first brachials are very short, the inner two thirds very narrow and band-like, the outer third rapidly increasing in length so that the outer border is from three to four times as long as the inner, or the median length; interiorly their bases are not in apposition, and their inner borders diverge at somewhat more than a right angle.

The second brachials are irregularly quadrate, somewhat broader than long; their inner

angles are just in contact interiorly forming, with the widely diverging inner edges of the first brachials, large rhombic water pores resembling those between the IBr series.

The first syzygial pair (third and fourth brachials) is slightly longer inwardly than outwardly.

The remainder of the arm is as in other species of the genus; the eversion of the distal edges of the brachials is only slightly developed, and the spinosity is very fine.

P_1 has the first three segments broader than long, the fourth and fifth slightly longer than broad, and the remainder elongated, very greatly so distally.

Nepiometra A. H. Clark.

Key to the species of the Genus Nepiometra.

a^1 Centrodorsal relatively large, 3.5 mm. in diameter at the base; IBr_1 with the distal angles rounded off so that the lateral angles of the axillaries project beyond them forming prominent water pores (southwest of Cape Comorin, the southern tip of India; 774 Metres) . . . . . *obscura*

a^2 Smaller, with a relatively smaller centrodorsal which is never more than 3.0 mm. in diameter at the base

b^1 25—30 cirrus segments

c^1 larger, arms about 60 mm. long; cirri L—LX; earlier cirrus segments three times as long as the median diameter or even somewhat longer (Kei Islands; 204 Metres). . . . . *alcyon*

c^2 smaller, arms about 25 mm. long; cirri about XXX; earlier cirrus segments not more than twice as long as broad (Meangis Islands; 900 Metres) *laevis*

b^2 20—22 cirrus segments of which the longest are twice as long as the diameter of the expanded distal ends; arms about 30 mm. long; distal intersyzygial interval two oblique muscular articulations

c^1 last four or five cirrus segments very slightly longer than broad; IBr series and first two brachials with straight sides which are just in contact laterally (off southern Celebes; 1158 Metres) . . . . . *io*

c^2 last eleven cirrus segments broader than long; IBr series free laterally (Cocos Island, off Panamá; 1760 Metres) . . . . . *parvula*

1. *Nepiometra obscura* (A. H. Clark).

A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 240, fig. 45 (*Trichometra obscura*).

2. *Nepiometra alcyon* (A. H. Clark).

A. H. Clark. Notes from the Leyden Museum, vol. 34; 1912 (*Thaumatometra alcyon*).

Stat. 251. 5°28′.4 S., 132°0′.2 E. Arafura Sea. 204 Metres. 1 Ex.

The centrodorsal is conical with the sides slightly rounded, half again as broad at the base as high, almost entirely covered with closely crowded cirrus sockets arranged in alternating rows as in *Trichometra* and *Hathrometra*.

Cirri L—LX, 27—28 (usually 28), 18 mm. long; the longest segments are about three times as long as the median diameter, or about twice as long as the lateral diameter of the somewhat expanded distal ends; the terminal six or seven are slightly longer than broad; the short outer segments are laterally compressed, though not carinate dorsally; the median portion of the distal border on the dorsal side is produced distally into a broad rounded overlapping process with a serrate border.

The edges of the radials are just visible beyond the rim of the centrodorsal; their distal angles are slightly separated.

The IBr_1 are extremely short and band-like, four times as broad as the lateral length, which is nearly or quite twice as great as the median length; the sides are distinctly convergent.

The IBr_2 (axillaries) are rhombic, about as broad as long, with all the sides rather deeply concave; their lateral angles project a considerable distance beyond the distal angles of the narrow IBr_1.

The first brachials are very short, basally not quite in apposition internally, the inner edges being almost a straight line. All the brachials have slightly everted and finely spinous distal edges. As a whole the division series and arms resemble those of *Thaumatometra tenuis*. Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of two oblique muscular articulations.

P_1 is weak and slender, 7 mm. to 9 mm. long with 19—23 segments of which the first four are about as long as broad and the following slowly increase in length so that the outer are twice as long as broad or somewhat longer, with moderately produced and spinous distal ends, and the terminal slender and much elongated. P_2 is about 10 mm. long with 16 segments of which the first two are about as long as broad, the third and fourth twice as long as the median diameter, and the following greatly elongated; the pinnule is considerably stouter than P_1, and may bear a fusiform gonad on the fifth-eighth segments. The distal pinnules are 10 mm. long with about 15 segments which have much expanded anterior, and overlapping and finely spinous distal, ends.

The arms are probably about 60 mm. long.

3. *Nepiometra laevis* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 187, pl. 31, fig. 6 (*Antedon laevis*).

4. *Nepiometra io* nom. nov.

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 179, pl. 32, fig. 6 (? *Antedon alternata*; specimen from Stat. 218).

A. H. CLARK. Notes from the Leyden Museum, vol. 34, 1912, p. 146 (*Trichometra delicata*; not of A. H. CLARK, 1911).

—— Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 64 (*Trichometra ? delicata*).

Stat. 211. 5°40'.7 S., 120°45'.5 E. Banda Sea. 1158 Metres. 1 Ex.

The centrodorsal is rounded conical, about 1.2 mm. broad at the base and about 0.9 mm. from the apex to the interradial border, similar to, but very slightly longer than, the

centrodorsal of the specimen shown in fig. 6 on pl. 32 of the "Challenger" report; it is almost entirely covered by about forty closely crowded cirrus sockets; the small bare polar area has a few long tubercles.

The cirri are abóut XL, 21—22, about 10 mm. in length; the first segment is short, the second nearly or quite as long as the diameter of the expanded distal end, the third half again as long as the diameter of the expanded distal end, the fourth and fifth the longest, twice as long as the diameter of the expanded distal ends; the following gradually decrease in length so that the last four or five are only very slightly longer than broad; the longer earlier segments have broadly expanded overlapping distal ends, this character becoming less and less pronounced distally, and absolete on the terminal segments where there is only a slight ventrolateral overlap; the short distal segments develop a slightly carinate dorsal spine.

The radials are very short in the median line, but extend well up in the angles of the calyx so that the bases of the IBr_1 are not in apposition.

The IBr_1 are very short, about five times as broad as long in the median line, slightly longer laterally than centrally; the lateral borders are parallel; the distal edges, except in the median line, are everted and finely spinous; the proximal border is slightly everted; there is a tuft of spines on the distal angles.

The IBr_2 (axillaries) are almost triangular, slightly broader than long; the distal edges are slightly everted and very finely spinous; the lateral angles are covered with spines.

The IBr series and lower brachials are in lateral contact except for small "+" shaped water pores.

The arms are about 30 mm. long; the brachials have only very slightly produced and very finely spinous distal ends. The distal intersyzygial interval is two oblique muscular articulations.

The specimen of "*Antedon alternata*" represented in fig. 6 of pl. 32 of the "Challenger" report, which was dredged north of New Guinea in 1926 Metres, certainly belongs to the genus *Nepiometra*, and very possibly to this species.

5. *Nepiometra parvula* (Hartlaub).

HARTLAUB. Bull. Mus. Comp. Zoöl., vol. 27, 1895, N⁰ 4, p. 144, pl. 3, fig. 21 (*Antedon parvula*).

Phrixometra A. H. Clark.

The only species in the genus *Phrixometra* is

1. *Phrixometra longipinna* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 185, pl. 30, figs. 1—3 (*Antedon longipinna*).

Bathymetra A. H. Clark.

Key to the Species of the Genus Bathymetra.

a¹ Centrodorsal low, subconical, about half as high as broad, the cirrus sockets

evenly distributed over its surface; basal portion of animal widening rapidly in a broad curve, reaching the maximum width at the axillary; radials short, more than twice as broad as long in the median line, their dorsal profile, which is convex, making an angle of about 90° with each other, or of 45° with the dorsoventral axis (west of Tasmania; 4680 Metres) . . . . . *carpenteri*

a^2 Centrodorsal about as high as broad at the base, bearing cirri only about the dorsal pole, the basal half or more being smooth and without cirrus sockets; basal portion of the animal constricted, the sides of the IBr series and arm bases, which make approximately a straight line, diverging slowly at the very small angle with the dorsoventral axis so that the maximum width is at the height of the second brachial; radials longer, twice as broad as long in the median line, the dorsal profiles, which are concave, making an angle of 60° with each other, or of 30° with the dorsoventral axis (west of Japan; 5220 Metres) . . . . . *abyssicola*

1. *Bathymetra carpenteri* A. H. Clark.

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 191 (part), pl. 33, fig. 2 (not fig. 1) (*Antedon abyssicola*).
A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 235 (*Bathymetra carpenteri*).

2. *Bathymetra abyssicola* (P. H. Carpenter).

P. H. Carpenter. "Challenger" Reports. Comatulae, 1888, p. 191 (part), pl. 33, fig. 1 (but not fig. 2) (*Antedon abyssicola*).

Thaumatometra A. H. Clark.

Key to the Species of the Genus Thaumatometra.

a^1 Large, the arms being from 110 mm. to 130 mm. long; P_1 20 mm. long with 35 segments of which the proximal 12 are short and wide, mostly wider than long, and the distal 23 are elongated and slender; P_2 slightly shorter with 20 segments of which the 2 basal are wider than long and the distal 10 are much elongated, the basal 10 carinate; following pinnules similar to P_2; cirri XL—L, 20, 35 mm. long (western part of the Sea of Japan and the Gulf of Tartary from Korea northward to Sakhalin Island [to 47° 38′ 40″ N.]; 144—1116 [? 1440] Metres). . *tenuis*

a^2 Smaller, the arms never over 45 mm., and very rarely over 30 mm. in length; P_1 with not over 20, and rarely over 15 segments; cirri with a maximum of 18; and rarely over 15 segments

b^1 14—18 (usually 15) cirrus segments, of which the longest are from three to four times as long as the proximal diameter

c^1 cirrus segments much elongated, subequal, the antepenultimate about

three times as long as the proximal width, the penultimate twice as long as broad; distal edges of the cirrus segments much expanded; cirri about XXX, 15—18; arms about 30 mm. long; P_1 slender and delicate, with 10—12 elongated segments; P_2 and the following pinnules longer, with stouter segments and a gonad (between Marion Island and the Crozets; 2880 Metres) . . . . . *abyssorum*

c^2 cirrus segments much elongated proximally but becoming shorter distally so that the last two are never more than twice as long as the proximal width; distal edges of the cirrus segments, especially of the outer, less produced

d^1 distal cirrus segments shorter, the last three or four being less than twice as long as broad

e^1 centrodorsal hemispherical; cirri XXV—XXXV, 15; arms 25 mm. long (southern Japan; 1395 Metres). . . . . *cypris*

e^2 centrodorsal much flattened, almost discoidal; cirri XL—LX; arms between 30 mm. and 45 mm. long

f^1 cirri XL—XLV, 13—17 (usually 15), 8 mm. long; arms about 45 mm. long (Yezo Strait, Japan; 540—959 Metres). . . . . *comaster*

f^2 cirri LV—LX; arms probably between 30 mm. and 35 mm. long (southwest of Cape Comorin, the southern tip of India; 774 Metres). . . . . *plana* [1])

d^2 distal cirrus segments longer, the third and fourth from the end of the cirrus being distinctly more than twice as long as broad

e^1 P_1 has 15—20 segments

f^1 IBr series and first two brachials very strongly convex dorsally, entirely and widely free laterally; IBr_1 with strongly converging sides, the lateral angles of the axillaries projecting for a considerable distance beyond their distal angles; axillaries about as broad as long; cirri about XL, 15—16; cirrus segments more elongate, the proximal with more strongly produced distal ends (south of Sumbawa; 959 Metres). . . . *thysbe*

f^2 IBr series and first two brachials in lateral contact; axillaries much broader than long; cirri XXV—XXXV, 15; distal cirrus segments less elongate, the proximal with less strongly produced distal ends (northeast of New Zealand and near the Kermadec Islands; 1134—1260 Metres) . *alternata*

e^2 P_1 has 11 segments; cirri XXX—LX, 14; arms about 23 mm. long (western Bering Sea; 3178 Metres) . . . . . *brevicirra*

1) The cirri of this species are not known, but it seems to belong here.

b^2 10—12 cirrus segments

c^1 cirrus segments shorter, the longest (third and fourth) between three and four times as long as broad; antepenultimate about twice as long as broad; penultimate about half again as long as broad; cirri about XXX, 10—12, 9 mm. long; arms about 30 mm. long; P_1 6 mm. long with 15 segments, of which the second and third are about as long as broad, very slender; P_2 very slightly shorter, with the first segment short, the second about as long as broad, the third half again as long as broad, and the following elongated; P_2 bears a gonad (Sagami Bay, Japan; 216—477 Metres) . . . . . *parva*

c^2 cirrus segments longer, the longest (fourth and fifth) nearly or quite six times as long as the proximal breadth; segment preceding the antepenultimate three times as long as broad; antepenultimate twice as long as broad; penultimate half again to twice as long as the distal diameter; cirri XXX, 10, 6 mm. long; P_2 somewhat longer and stouter than P_1 (southwest of Iceland; 2043 Metres) . . . . . *septentrionalis*

1. *Thaumatometra tenuis* (A. H. Clark).

VON GRAFF. "Challenger" Reports. Myzostoma, 1884, p. 79 (? *Antedon* sp.; Vladivostock).
A. H. CLARK. Proc. U. S. National Museum, vol. 33, 1907, p. 80 (*Antedon tenuis*); p. 81 (*Antedon ciliata*).
—— Vidensk. Medd. fra den naturhist. Forening i København, 1909, p. 191 (*Thaumatometra tenuis*).

2. *Thaumatometra abyssorum* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 190, pl. 29, figs. 10—13 (*Antedon abyssorum*).

3. *Thaumatometra comaster* A. H. Clark.

A. H. CLARK. Proc. U. S. National Museum, vol. 34, 1908, p. 232 (*Thaumatometra comaster*).

4. *Thaumatometra cypris* A. H. Clark.

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 179 (part), pl. 32, figs. 5, 7, 8, 9 (*Antedon alternata*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 65 (*Thaumatometra cypris*).

5. *Thaumatometra alternata* (P. H. Carpenter).

P. H. CARPENTER. Quart. Journ. Micros. Sci., vol. 27, 1887, p. 386 (*Antedon tenuis*; nomen nudum).
VON GRAFF. "Challenger" Reports. Myzostoma, 1887, p. 6 (*Antedon alternata*; nomen nudum).
P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 179 (part), pl. 18, figs. 1—3 (*Antedon alternata*).
A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 65 (*Thaumatometra alternata*).

6. *Thaumatometra thysbe* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 149 (*Thaumatometra thysbe*).

Stat. 52. 9° 3'.4 S., 119° 56'.7 E. Savu Sea. 959 Metres. 1 Ex.

The centrodorsal is small, rounded conical.

The cirri are about XL, 15—16, 9 mm. long; the first segment is short, the second about as long as the diameter of the expanded distal end, the third twice as long as the diameter of the expanded distal end, and the fourth slightly longer; the following very slowly decrease in length so that the last two before the penultimate are from one third to one half again as long as broad; the earlier segments have greatly enlarged ends, the distal end being much expanded and overlapping the base of the succeeding segment; as the segments become shorter the dorsal and ventral profiles become straighter and the segments become compressed laterally so that they appear broader in lateral view; on the distal short segments the median portion of the distal edge on the dorsal side projects slightly over the base of the following segment.

In the median line the radials are just visible beyond the edge of the centrodorsal, but they extend well up in the angles of the calyx; their distal angles are slightly separated so that the bases of the IBr_1 are not quite in apposition.

The IBr_1 are very short, almost oblong, about four times as broad as the exterior length, which is slightly greater than the median length; the lateral borders of adjacent IBr_1 make an angle of about 90° with each other; the distal edges are narrowly everted and very finely spinous.

The IBr_1 (axillaries) are about as broad as long; the distal edges make approximately a right angle with each other; the distal angle is not produced; a broad posterior process incises the IBr_1; the lateral angles extend considerably beyond the distal angles of the IBr_1; the distal edges are evenly and very finely spinous.

The arms are 30 mm. long and resemble those of the other species of the genus; the distal edges of the brachials are moderately everted and finely spinous. Syzygies occur between the third and fourth brachials, again between the ninth and tenth and fourteenth and fifteenth, and distally at intervals of two oblique muscular articulations.

P_1 is excessively delicate, about 6.5 mm. long, composed of 15 + segments of which the first is very short, the second longer, the third about as long as broad, the fourth half again as long as broad, the following becoming exceedingly elongated with swollen, produced and overlapping spinous distal ends. P_2 is stouter than P_1, composed of 11 or 12 segments of which those beyond the third are excessively elongated, becoming exceedingly slender distally; the fourth-seventh segments bear a large genital gland.

7. *Thaumatometra brevicirra* (A. H. Clark).

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 235 (*Bathymetra brevicirra*).

8. *Thaumatometra parva* A. H. Clark.

A. H. Clark. Proc. U. S. National Museum, vol. 34, 1908, p. 231 (*Thaumatometra parva*).

9. *Thaumatometra septentrionalis* A. H. Clark.

A. H. Clark. Die Crinoiden der Antarktis, 1915, p. 147 ("unbenannte Art vom Gebiet südwestlich von Island").

Description in press.

10. *Thaumatometra plana* (A. H. Clark).

A. H. Clark. Crinoids of the Indian Ocean, 1912, p. 240 (*Trichometra plana*).

Orthometra A. H. Clark.

The only species in the genus *Orthometra* is

1. *Orthometra hibernica* (A. H. Clark).

A. H. Clark. Fisheries, Ireland, Sci. Invest., 1912, N° 4, p. 2 (*Trichometra hibernica*).

Tonrometra A. H. Clark.

Key to the Species of the Genus Tonrometra.

a¹ None of the cirrus segments longer than the diameter of the much expanded distal ends; arms 10 mm. long; cirri XXX, 18—20, 4 mm. long (east of Halmahera [Gilolo]; 1089 Metres) . . . . . *brevipes*

a² Longest proximal cirrus segments longer than the diameter of the much expanded distal ends; arms probably about 40 mm. long; cirri XX—XXX, nearly 20 (between Marion Island and the Crozets; 2880 Metres) . . . . . *remota*

1. *Tonrometra brevipes* (A. H. Clark).

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 147 (*Trichometra brevipes*).

Stat. 150. 0°06′ N., 129°7′.2 E. Halmahera Sea. 1089 Metres. 1 Ex.

The centrodorsal is low conical, twice as broad basally as high, bearing about thirty closely crowded and irregularly placed cirrus sockets which have very prominent rims.

The cirri are about XXX, 18—20, about 4 mm. long; the first segment is very short, the second is about as long as the median diameter, the third-fifth or -sixth are the longest, about as long as the diameter of the expanded distal ends; the following gradually decrease in length so that the outermost nine or ten are slightly broader than long; the longer earlier segments are constricted centrally with greatly expanded and overlapping distal ends, this feature rapidly decreasing as the segments become shorter; the short outer segments are subcarinate dorsally, and bear a slight dorsal spine.

The radials are concealed by the centrodorsal.

The IBr_1 are extremely short, and are in close lateral apposition; the lateral edges are slightly everted.

The IBr_2 (axillaries) are nearly as broad as long, almost triangular, the lateral angles just in apposition with the lateral angles of the adjacent axillaries, and bear a moderately developed rounded posterior process.

The edges of the ossicles of the IBr series and of the brachials are prominently everted and spinous; the dorsal surface of the lower brachials is also more or less thickly covered with very fine spines. There is a faint shallow median groove on the IBr_1 and IBr_2.

The ends of the proximal cirrus segments are very spinous, and their dorsal surface is slightly carinate.

P_1 is excessively delicate; the segments after the third are greatly elongated with expanded and finely spinous distal ends.

2. *Tonrometra remota* (P. H. Carpenter).

P. H. CARPENTER. "Challenger" Reports. Comatulae, 1888, p. 184. pl. 29, figs. 5—9 (*Antedon remota*).

A. H. CLARK. Smithsonian Miscellaneous Collections, vol. 61, 1913, N° 15, p. 66 (*Thaumatometra remota*).

II. Family PENTAMETROCRINIDAE A. H. Clark.

Key to the Genera of the Pentametrocrinidae.

a¹ Ten radials and ten (undivided) arms . . . . . **Thaumatocrinus**
a² Five radials and five (undivided) arms . . . . . **Pentametrocrinus**

Thaumatocrinus P. H. Carpenter.

Key to the Species of the Genus Thaumatocrinus.

a¹ Small species with a small centrodorsal which bears fewer than twenty cirri
  b¹ cirri XV—XX, excessively slender, with enormously elongated segments of which the third is about four times as long as the diameter of the expanded proximal end, and the fourth is six times as long as its proximal diameter (extreme south of the Indian Ocean) . . . . . *renovatus* [1])
  b² cirri XI—XIII (very rarely more), slender, but not excessively so, with less elongated segments than in the preceding, the third never being more than twice as long as broad, and the fourth usually less than four times as long as the diameter of the expanded ends (southwest of Iceland) . *jungerseni*
a² Larger species with a large and broad centrodorsal which bears more than forty cirri
  b¹ second brachial more than twice as long as the first, which is disproportionately small (southern Japan) . . . . . *borealis*

1) Synonym *Promachocrinus abyssorum* P. H. Carpenter.

b^2 second brachial not appreciably longer than the first

c^1 proximal portion of the arms broad, very rugged, and with the articular tubercles very strongly developed (Hawaiian Islands) . . . . . *rugosus*

c^2 proximal portion of the arms only very slightly enlarged, smooth, without any trace of articular tubercles (Meangis Islands and Moluccas) . . . . . *naresi*

1. *Thaumatocrinus naresi* (P. H. Carpenter).

P. H. CARPENTER, Proc. Roy. Soc., vol. 28, p. 385 (*Promachocrinus naresi*).
—— "Challenger" Reports. The Comatulae, p. 352, pl. 69, figs. 8—10 (*Promachocrinus naresi*).

Stat. 122. 1° 58′.5 N., 125° 0′.5 E. Sangi Islands, northeast of Celebes. 1264—1165 Metres. 1 mutilated Ex.

The centrodorsal is very low hemispherical with a strongly flattened dorsal pole, and measures 6 mm. in diameter. It bears XXXV cirrus sockets in three closely crowded alternating rows.

Fig. 14. Dorsal view of the central portion of a specimen of *Thaumatocrinus naresi* from Stat. 122. About natural size. (Courtesy of the U.S. National Museum).

The ten radials are in mutual apposition all around the calyx, being only slightly separated at the distal angles; they are short, projecting beyond the centrodorsal for a distance equal to from one third to one half the length of the first brachial.

The first brachials are approximately oblong, averaging twice as broad as long; the second brachials are similar, of about the same size or slightly shorter.

The arms from the distal edge of the radials to the distal edge of the fourth brachial (the first syzygy) measure 6 mm.

Thaumatocrinus borealis, which I recently combined with *Th. naresi* as a synonym, is in reality a perfectly good species. It is readily distinguished from the allied species by the small size of the first and the large size of the second brachials, the latter being nearly or quite twice as large as the former. In *Th. naresi* the first three brachials are all of about the same size. *Th. borealis* is larger and more rugged and robust than *Th. naresi*.

Pentametrocrinus A. H. Clark.

Key to the Species of the Genus Pentametrocrinus.

a^1 A pinnule on the second brachial; cirri greatly elongated, straight for most of the length, gently recurved at the tip, tapering to a point, composed of 18—22 segments; all the cirrus segments (except the basal) greatly elongated; terminal claw minute, conical (Bay of Bengal to the East Indies, the Philippine Islands and southern Japan) . . . . . *varians*

a^2 The first pinnule on the fourth brachial

b^1 cirri greatly elongated, straight for most of the length, gently recurved at the tip, tapering to a point, composed of 25—30 segments; all the cirrus

segments (except the basal) greatly elongated; terminal claw minute, conical
c¹ disk completely covered with small calcareous granules (New Zealand and New South Wales to the East Indies) . . . . . *semperi*
c² disk naked (southern Japan to Celebes and the Paternoster Islands) . . . . . *japonicus*
b² cirri of medium length or short, more or less recurved throughout their entire length, composed of 14—17 segments; terminal claw recurved and hook-like
c¹ articular tubercles very strongly developed, giving the arms a very rugged appearance (southern Japan) . . . . . *tuberculatus*
c² articular tubercles not developed, so that the arms appear smooth
d¹ disk naked (southern Japan to the Philippines). . . . . *diomedeae*
d² disk completely covered with small calcareous granules (northwestern Africa to western Ireland; Caribbean Sea). . *atlanticus*

1. *Pentametrocrinus diomedeae* A. H. Clark.

A. H. Clark. Smithsonian Miscellaneous Collections (Quarterly Issue), vol. 52, part 2, p. 234.

Stat. 95. 7°43′.5 N., 119°40′ E. Sulu Archipelago. 522 Metres. 5 Ex.

The best preserved specimen has the cirri 27 mm. long with 17—18 (usually 18) segments. It agrees well with a specimen from "Albatross" Station 5173 (between Mindoro and Luzon, Philippine Islands) which has the cirri 22 mm. long, composed of 14—16 segments, which are of the same relative proportions as those of the individual under consideration, but is somewhat smaller. The difference in size probably accounts for the difference in the length of the cirri and in the number of the segments. The type of *P. diomedeae*, from southwestern Japan, has 14—17 cirrus segments.

Of the other specimens one resembles the one just noticed, and the other three are small. One of the latter has the cirri 15 mm. long, composed of 14—15 segments.

2. *Pentametrocrinus japonicus* (P. H. Carpenter).

P. H. Carpenter. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 499 (*Eudiocrinus japonicus*).
—— "Challenger" Reports. The Comatulae, p. 84, pl. 7, figs. 1, 2 (*Eudiocrinus japonicus*).

Stat. 38. 7°35′.4 S., 117°28′.6 E. Flores Sea. 521 Metres. 1 Ex.
Stat. 74. 5°3′.5 S., 119°0′ E. Makassar Straits. 450 Metres. 1 Ex.

The specimen from Stat. 38 is typical, agreeing well with the type in London and with numerous specimens from southern Japan in the United States National Museum. Its cirri are 35 mm. long, composed of 26 segments.

The individual from Stat. 74 has the cirri 50 mm. long, composed of 35 segments; it is slightly larger than the preceding, nearly as large as the largest "Albatross" specimen from southern Japan.

3. *Pentametrocrinus semperi* (P. H. Carpenter).

P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 497 (*Eudiocrinus semperi*).
—— "Challenger" Reports. The Comatulae, p. 82, pl. 3, fig. 7; pl. 6, figs. 1—3.

Stat. 211. 5°40′.7 S., 120°45′.5 E. Banda Sea. 1158 Metres. 2 Ex.

These two specimens agree well with the types in the British Museum; neither possesses cirri, nor arms beyond the first syzygy (between the fourth and fifth brachials).

On one arm of one of the specimens the first brachial is repeated as a small ossicle about one half the size of the normal first brachial, and of about half the width, being inserted between the normal first brachial and the second brachial; the articulations between the normal and the supernumerary first brachials, and between the latter and the second brachial, are both synarthries.

4. *Pentametrocrinus varians* (P. H. Carpenter).

P. H. CARPENTER. Journ. Linn. Soc. (Zoöl.), vol. 16, 1882, p. 496 (*Eudiocrinus varians*).
—— "Challenger" Reports. The Comatulae, p. 81, pl. 7, figs. 3—7 (*Eudiocrinus varians*).

Stat. 45. 7°24′ S., 118°15′.2 E. Flores Sea. 794 Metres. 2 Ex.
Stat. 48. 8°4′.7 S., 118°44′.3 E. Flores Sea. 2060 Metres. 2 Ex.
Stat. 314. 7°36′ S., 117°30′.8 E. Flores Sea. 694 Metres. 2 Ex.

The two examples from Stat. 45 are of medium size; the more perfect has the cirri 22 mm. long composed of 19 segments.

The two specimens from Stat. 48 are small and much broken.

The larger specimen from Stat. 314 has the arms about 120 mm. long; the swollen ovaries appear to contain ripe eggs. The smaller specimen has the arms about 90 mm. long, and the cirri 17 mm. long, composed of 21 segments.

III. Family ATELECRINIDAE Bather.

Key to the Genera of the Atelecrinidae.

a¹ Five arms; no basals; five large basal rays separating from each other the five deep subradial clefts; . . . . . **Atopocrinus**

a² Ten arms; basals always present, though sometimes only visible in the angles of the calyx; no subradial clefts . . . . . **Atelecrinus**

Atopocrinus A. H. Clark.

A. H. CLARK. Notes from the Leyden Museum, vol. 34, p. 150.

Diagnosis. — A genus of Atelecrinidae in which the arms are five in number; all the pinnules are present; the basals are resorbed, but five large basal rays are visible in the angles

of the calyx, between which are deep clefts extending inward between the centrodorsal and the radials as in *Zenometra* and the large species of *Psathyrometra*.

This genus includes only the following species.

1. *Atopocrinus sibogae* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, p. 151.

Stat. 177. 2° 24′.5 S., 129° 38′.5 E. Ceram Sea. 1633 Metres. 1 Ex.

The centrodorsal is elongate conical, 5.5 mm. broad at the base and 7 mm. long, the sides straight. Five strong interradial ridges each about as broad as the adjacent columns of cirrus sockets divide the lateral surface of the centrodorsal into five radial areas, each of which is divided by a narrow median ridge which, except at the base, is as high as the interradial ridges. The distal border of each cirrus socket is produced outward forming a strong ridge across the proximal border of the one next below. Thus each cirrus socket occupies an approximately oblong rather deep pit bounded proximally and distally by these ridges just described, and laterally by the longitudinal interradial and radial ridges. There are thirteen or fourteen cirrus sockets in each radial area, making about sixty-eight in all. The youngest cirrus sockets, on the proximal margin of the centrodorsal, project above the general surface of the latter, appearing like the first segment of a cirrus. Each cirrus socket bears on either side of the minute central canal (which is slightly below its centre) a strong rounded (fulcral) ridge; this, like the produced distal border of the cirrus sockets, gradually decreases in height proximally, but much more rapidly decreases in height distally. These transverse fulcral ridges are on either side produced outward to a point which is somewhat higher than the general surface of the interradial and the radial ridges between the columns of cirrus sockets, so that in profile these ridges appear very strongly serrate, the radial rather more so than the interradial, the teeth of the serrations being convex proximally and concave distally; in a lateral view of the centrodorsal these projections appear as alternating bracket-like processes proximally arising gradually but distally terminating abruptly in a straight horizontal border. On the interradial ridges these projections are separated by a median free bare area about equal to their own lateral height, but on the radial ridges they occur almost in a straight line. As in *Zenometra* and in *Psathyrometra* deep subradial clefts occur between the radials and the centrodorsal; in height these are equal to one half of the dorsoventral diameter of the topmost fully developed cirrus sockets.

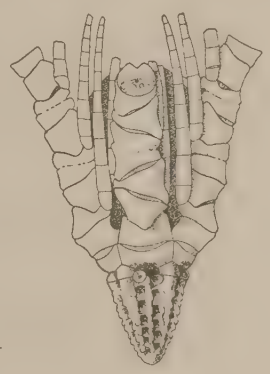


Fig. 15.
Lateral view of the specimen of *Atopocrinus sibogae* from Stat. 177. × 2. (Courtesy of the U. S. National Museum).

High and narrow basal rays, of which the outer ends are broadly pentagonal and convex, cap the proximal ends of the interradial ridges and extend inward under the radial pentagon, forming the sides and the blind inner wall of the subradial clefts.

The cirri are lacking.

The radials are about twice as broad as high in the median line, but recumbent, so

that in a direct lateral view they appear about four times as broad as high; they are thus much shorter than the radials of the species of *Atelecrinus*.

The arms are five in number, very stout and probably also very long. All are broken off at the base, the longest stump measuring 19 mm. from the subradial cleft to the distal border of the tenth brachial.

The first brachial is slightly over twice as broad as its lateral length, and is basally just in apposition with its neighbors; the lateral edges are approximately perpendicular to the proximal border; there is a deep notch in the distal outer angle. The second brachial is very irregularly quadrate, the longer side longer than the sides of the first, the shorter about the width of the pinnule which it bears, and somewhat produced ventrally; there is a strong but evenly rounded synarthrial tubercle at the junction of the first and second brachials, the body of the animal at the synarthrial tubercles being 11 mm. in diameter. The third brachial is approximately triangular, not quite so long as broad, with strongly concave sides. The fourth and fifth brachials form a syzygial pair which is approximately triangular (both elements being triangular, the hypozygal slightly longer than the epizygal) and about as long as broad; the following brachials are similar to the third, gradually becoming slightly longer in proportion to their width, and the shorter side becoming slightly longer. None of the arms are preserved beyond the tenth brachial.

Syzygies occur on the various arms as follows: left posterior, brachials $4 + 5$, $7 + 8$, $10 + 11$; left anterior, $4 + 5$, $7 + 8$, $10 + 11$; anterior, $4 + 5$, $7 + 8$; right anterior $4 + 5$, $7 + 8$, $10 + 11$; right posterior, $3 + 4$, $6 + 7$, $9 + 10$.

The width of the arm at the base of the first brachial is 4 mm., at the first syzygy 3.5 mm., and at the third syzygy 3.5 mm.

The surface of the disk is more or less mutilated and concealed. The disk resembles that of *Atelecrinus*, and is comparatively small and compact; its ventral surface reaches the height of the base of the ninth brachial. The ventral surface of the disk is in the form of a high rounded dome, beginning to curve inward at about the fifth brachial; from this point the ambulacra, which reach the arms at about the ninth brachial, are supperted upon high narrow bridges as in *Gephyrocrinus*, *Thalassocrinus* and *Ptilocrinus*. Up to the height of the general surface of the disk the pinnules are connected with it by webs or thin sheets of perisome, resembling the thicker sheets which support the brachial ambulacra in their passage to the arms. A strip of thickened perisome extends downward interradially to the union of the first brachials, just above which it bears a cluster of about a dozen rounded calcareous plates. Just above the union of the first brachials are deep oval pits, whether blind or not cannot be determined without dissection; similar but somewhat larger pits occur just beyond the distal angles of each first brachial, on either side of each syzygy, and at the base of each pinnule.

The sculpture of the syzygial faces in this species is unique. Laterally and dorsally the central canal is bounded by a high ridge of moderate width; from this ridge there extends to the dorsal margin of the joint face in the dorsoventral line another ridge which at first is about as broad as the ridge from which it springs, but outwardly gradually broadens slightly. two similar ridges extend outward, one from either end of the latero-dorsal ridge about the

central canal, making with the median ridge an angle of about 45°, or about a right angle with each other; just beyond these lateral ridges, entirely unconnected with the ridge about the central canal, separated from the lateral ridges by a ligament space about the same in shape and size as the two lateral ridges, are two more ridges, slightly broader than the others; each has a very narrow fan-shaped space beyond it; beyond these two ligament spaces, the distal borders of which are approximately at right angles to the dorsoventral axis of the joint face, are two large obsolete muscular fossae which are about as high as the distance between their proximal border and the dorsal edge of the joint face; these are rounded triangular in shape; inwardly each rises somewhat, forming two parallel, very inconspicuous, low well rounded ridges, which are interiorly separated by a shallow rounded groove which becomes more accentuated just beyond the central canal, where it separates the inner ends of the inner pair of ridges; the inner ends of the ligament spaces just beyond these ridges are bounded by the ridges bordering the muscular fossae interiorly. There is a deep intermuscular notch the sides of which make an angle of from 60° to 90° with each other. The ridges on the syzygial faces are high, and consequently the ligament fibres are long, appearing in dorsal view almost quite as long as those of the neighboring dorsal ligaments.

All the pinnules are present; P_1 is about 16 mm.; the first segment is slightly trapezoidal, viewed from the side about half again as long as broad; the second is between two and one half and three times as long as broad, 2.3 mm. long; the following segments are similar, but proportionately somewhat longer; the pinnule is moderately stout, like the proximal pinnules of the large species of *Psathyrometra*, and is somewhat compressed laterally; the first segment increases somewhat in diameter distally, the second decreases slightly, and the third also decreases slightly, more especially in the proximal half; from that point onward the pinnule tapers very gradually. P_2 is 15 mm. long with ten segments, and resembles P_1; the fourth segment, which is the longest, is about three and one half to four times as long as broad, and the fifth is about the same; but the sixth and following are only about twice as long as broad, or slightly less. Only the bases of the following pinnules are preserved; they appear to become gradually shorter and more slender, the second segment decreasing rapidly in length and progressively decreasing more and more rapidly in diameter distally, on the pinnule of the ninth brachial being not quite so long as its proximal width, and slightly trapezoidal, so that the following segments of the pinnule must be very slender.

In looking into the relationships of this curious comatulid one naturally turns first to the family Pentametrocrinidae, in which family the genus *Pentametrocrinus* also has but five arms with no IBr series, and has the first syzygy between the fourth and fifth brachials instead of between the third and fourth as usual.

But in the Pentametrocrinidae (1) the disk is large and stellate and extends far out upon the arms, being nearly or quite black in colour; (2) the cirrus sockets are closely crowded and irregularly arranged on a rounded conical or hemispherical centrodorsal; (3) the individual cirrus sockets have no fulcral ridges nor produced margins; (4) the radials are almost or quite concealed by the centrodorsal; (5) the lower brachials are more or less oblong,

the triangular form not becoming pronounced until after the third or fourth; and (6) the second segment of the lowest pinnules is very short. Clearly, therefore, *Atopocrinus* cannot belong to the Pentametrocrinidae.

Atopocrinus suggests the genus *Zenometra* in certain ways — the arms are stout and robust, and the conical centrodorsal is divided into ten sharply delimited areas each with a column of cirrus sockets, but (1) in *Zenometra* the disk is broader and the ambulacra run direct from its surface to the ventral surface of the arms; (2) the earlier brachials and the first syzygial pair are oblong; and (3) the cirrus sockets have no fulcral ridges.

In (1) the details of the arrangement of the cirri on the centrodorsal, in (2) the details of the structure of the cirrus sockets, in (3) the structure of the disk, in (4) the triangular brachials at the base of the arms, and especially in (5) the triangular first syzygial pair, *Atopocrinus* agrees with *Atelecrinus* and differs from all other comatulids.

Atopocrinus differs from *Atelecrinus* (1) in having no basals, (2) in having only five arms, and (3) in having all of the pinnules present.

Though very large in *Atelecrinus anomalus*, the external basals become very greatly reduced in such species as *A. sulcatus*, the variation in size being so great as to suggest that their presence or absence does not constitute a valid major character in the diagnosis of the family.

In the family Zygometridae one of the genera, *Eudiocrinus*, possesses only five arms, so that the same condition in a single genus of another family might be anticipated.

In the Comasteridae, Colobometridae, Zenometrinae, Perometrinae and Pentametrocrinidae species (or genera) with deficient, and also with complete, pinnulation are found; it is therefore quite natural that there should be a genus of Atelecrinidae with complete pinnulation.

Since the differences between *Atopocrinus* and *Atelecrinus* are of relatively small importance while the differences between *Atopocrinus* and all the other comatulid genera are fundamental, we appear to be abundantly justified in placing *Atopocrinus* in the Atelecrinidae.

Atelecrinus P. H. Carpenter.

Key to the Species of the Genus Atelecrinus.

a^1 The centrodorsal bears 15 columns cirrus sockets (Hawaiian Islands). . *conifer*

a^2 The centrodorsal bears 10 columns of cirrus sockets

b^1 basals very large, the height equal to more than half the width; no raised rim about the cirrus sockets; cirri with 19—20 segments, of which the outer are but little longer than broad, ending in a stout recurved claw (Moluccas) . . . . . *anomalus*

b^2 basals very low, forming a narrow band between the radials and the centrodorsal, or reduced to low triangular areas in the angles of the calyx; a horseshoe-shaped rim borders the cirrus sockets proximally and laterally

c^1 on the surface of the centrodorsal the columns of cirrus sockets are segregated in five pairs by relatively broad shallow interradial grooves;

the sockets of the two columns in each radial area are quite distinct from each other; the interradial ridges on the proximal portion of the centrodorsal are low, rounded and short

d¹ basals separated from the centrodorsal at the interradial angles (Fiji) *wyvillii*

d² basals everywhere in contact with the centrodorsal (Moluccas and Philippines) . . . . . *sulcatus*

c² the 10 columns of cirrus sockets are closely crowded on a small sharply conical centrodorsal; the interradial ridges on the proximal portion of the centrodorsal are high and sharp

d¹ centrodorsal with the sides more nearly parallel at the base than further out, and much longer than broad at the base (Caribbean Sea) . . . . . *balanoides* [1])

d² centrodorsal sharply conical, very slightly longer than broad at the base (western coast of Ireland) . . . . . *helgae*

1. *Atelecrinus sulcatus* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 152.

Stat. 85. 0° 36′.5 S., 119° 29′.5 E. Makassar Straits. 724 Metres. 1 Ex.

The centrodorsal is sharply conical, 3 mm. broad at the base and 4 mm. in vertical height. The cirrus sockets are arranged in ten columns four, more rarely five, to a column; the two columns of each radial area are close together; the columns of adjacent radial areas are separated by shallow furrows which basally are in width nearly equal to the diameter of the adjacent cirrus sockets, but become gradually narrower distally; the interradial separation of the columns of cirrus sockets is always somewhat greater than the midradial separation. Each cirrus socket is bordered proximally and laterally by a horseshoe-shaped rim which proximally scarcely rises above the general surface of the centrodorsal, but on either side stands out as high ridge so that in lateral view the sides of the centrodorsal appear strongly serrate, the longer side of the teeth being gently convex, roughly parallel with the dorsoventral axis, the shorter slightly concave, at right angles to this axis. The ridges on either side of the cirrus sockets gradually increase in thickness distally, but terminate rather abruptly just after attaining their maximum height and thickness, so that the border of the cirrus sockets distal to them is not raised above the general surface of the centrodorsal. The basal outline of the centrodorsal as viewed dorsally is pentagonal, each side of the pentagon being slightly and evenly concave; five well marked rounded interradial ridges are present which slowly decrease in height and disappear at about the distal border of the first cirrus sockets. These ridges mark the angles of the pentagon when the

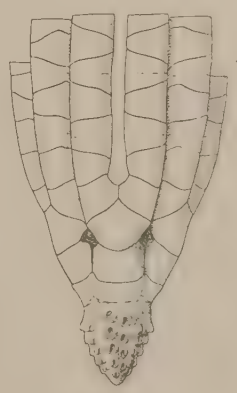


Fig. 16.
Lateral view of a specimen of *Atelecrinus sulcatus* from "Albatross" Stat. 5619. × 3. (Courtesy of the U. S. National Museum).

1) Synonyms *cubensis* P. H. Carpenter and *pourtalesi* A. H. Clark.

centrodorsal is viewed dorsally. Their height is scarcely more than sufficient to modify the normally circular base of the centrodorsal to a pentagon.

The basals form a very narrow band of almost uniform height between the radials and the centrodorsal, though they are slightly higher than elsewhere in the angles of the calyx where their dorsal surface is raised to form a proximal continuation of the interradial ridges on the centrodorsal.

The radials are relatively long, distally scarcely twice as broad as long in the median line; in lateral view the profile of the dorsal surface is straight; the proximal edge is somewhat shorter than the distal.

The IBr_1 is regularly oblong, about one third again as broad as long, entirely free basally; there is almost no incision of the proximal border; the distal lateral angles are slightly out away.

The axillaries are broadly pentagonal, slightly broader than long; their lateral edges slope slightly inward and downward so as to form, with the truncated anterior corners of the IBr_1, prominent water pores; similar pores occur between the first and second brachials, interiorly.

The visceral mass is high and narrow, and the ambulacra reach the arms along the summits of mesentary-like perisomic bridges as in *Gephyrocrinus* and in *Thalassocrinus*. The mouth is central. The disk is unplated.

The arms resemble those of *Atelecrinus wyvillii*; syzygies usually occur between brachials $3 + 4$, $6 + 7$ and $10 + 11$, and distally at intervals of three or four oblique muscular articulations.

The lowest pinnule (on two arms) is on the sixteenth brachial; the pinnules are small and weak, long-jointed and strongly flattened.

"Albatross" Stat. 5619. 0° 35′ 00″ N., 127° 14′ 40″ E., (Molucca Passage; Mareh Island bearing S. 78° E., 7 miles distant); 435 fathoms (783 Metres); fine gray sand and mud.

A specimen collected by the "Albatross" near the locality where the type was dredged by the "Siboga" appears to belong to this species. The centrodorsal is somewhat more sharply pointed. There are the same interradial furrows. The proximal interradial ridges, though prominent, are more rounded. The basals are visible only in the interradial angles of the calyx, in the form of low triangles with excessively produced lateral apices, which fail to meet the similarly produced apices of those on either side. The radials are considerably shorter than those of the type, and when the specimen is viewed laterally their dorsal profiles make considerably more than instead of less than, a right angle with each other. The ossicles of the IBr series are slightly shorter than those of the type, and the brachials also are proportionately slightly shorter. This gives the animal a more robust and compact appearance.

Atelecrinus sulcatus differs from *A. wyvillii* in having the centrodorsal, basals and radials all in intimate contact, there being no perisomic lacunae as in *A. wyvillii*. The centrodorsal differs from that of *A. wyvilli* in its more sharply conical form, its pentagonal base with interradial ridges proximally, passing into interradial furrows between the cirrus sockets, the greater height of the lateral ridges bordering the cirrus sockets, and the absence of notches on the proximal border.

2. *Atelecrinus anomalus* A. H. Clark.

A. H. Clark. Notes from the Leyden Museum, vol. 34, 1912, p. 153.

Stat. 177. 2° 24'.5 S., 129° 38'.5 E. Ceram Sea. 1633 Metres. 1 Ex.

Centrodorsal very long, about 1.8 mm. broad at the base and 3 mm. long radially, cylindrical in the proximal third, from that point onward (beginning rather abruptly) conical; the apex is rounded. The cirrus sockets are moderate in size, and are arranged in ten evenly spaced columns, three (rarely two or four) to a column. Each column is separated from its neighbors in the same column by about the distance that the columns are apart. The surface of the centrodorsal is smooth and undifferentiated; the cirrus sockets are simple excavations, without the raised borders usually found in the species of this genus; in each cirrus socket just above the middle a half conical ridge makes in from either side; these ridges are triangular in outline, the apex of the triangle abutting on the central canal. The ligament areas above (proximal to) these ridges are rounded proximally, the sides converging in a sharp angle at the central canal; their area is approximately equal to that of the ridges; the ligament areas below (distal to) these ridges are shallower, occupying about half the area of the cirrus socket or rather more. The interradial portions of the centrodorsal just below the basals are slightly raised above the general surface, so that a section of the centrodorsal through the base is rounded-pentagonal. The cirrus sockets occur almost exclusively on the conical outer two thirds of the centrodorsal.

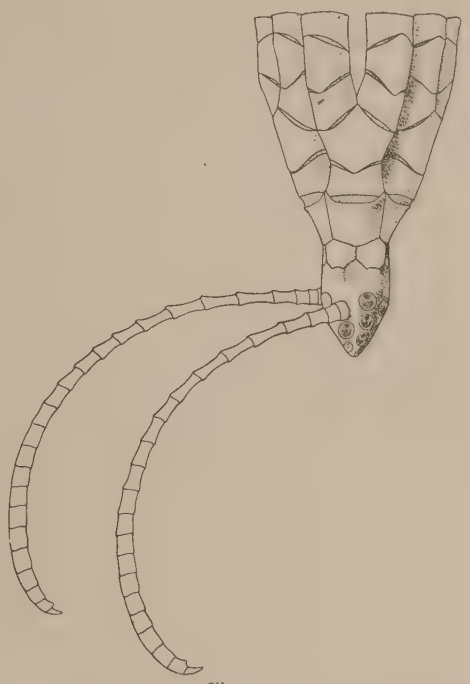


Fig. 17.
Lateral view of a specimen of *Atelecrinus anomalus* from Stat. 177. × 6. (Courtesy of the U. S. National Museum).

The cirri are XXX, 19—20, about 13 mm. long; the first two segments are about twice as broad as long, the third is slightly broader than long, or about as long as broad, the fourth is twice as long as the diameter of its ends, the fifth is nearly or quite three times as long as the diameter of its ends, and the sixth is slightly shorter; the following decrease gradually in length, so that the fourteenth and following are only slightly longer than broad; the fourth-seventh are moderately constricted centrally, but this central constriction disappears in the next two or three following, when the cirri become strongly compressed laterally. The opposing spine is terminal, small and blunt. The terminal claw is slightly longer than the penultimate segment, rather stout, evenly tapering, and rather strongly curved.

The short cirri of the species, which have short segments distally and a stout strongly curved terminal claw, are very different from the very long and slender type heretofore supposed to be characteristic of the species of *Atelecrinus*. It seems that in *Atelecrinus* we

have a strict parallel to the conditions found in the *Pentametrocrinus*, the cirri of the *Atelecrinus anomalus* type being characteristic of such species as *Pentametrocrinus tuberculatus* and *P. diomedeae*, and those of the *A. balanoides* or *A. conifer* type occurring in such forms as *P. varians* or *P. japonicus*.

The basals are very large and conspicuous, broadly seven sided, in contact laterally for a distance equal to about half the greatest (median) length; the proximal edge of the basals bordering the swollen interradial portion of the centrodorsal is slightly concave; the two adjacent proximal edges are of about the same length, but straight; the anterior angle of the basals is broadly obtuse, and is of the same degree as the midradial angle made by the proximal edges of adjacent basals over the proximal edge of the centrodorsal. The sides of the basal ring are parallel, so that the basal ring continues the column made by the columnar basal third of the centrodorsal.

The radials are slightly broader than long, in lateral contact throughout their entire length; their interradial angles are somewhat produced. Proximally the radials are slightly rounded dorsally, becoming more strongly rounded distally, especially at the sides, so that at the distal portion of the interradial areas there is a well marked interradial furrow.

The IBr_1 are proximally about as broad as the lateral length, and distally slightly broader than the lateral, though not quite twice as broad as the median, length; the lateral length is half again as great as the median length, due to incision by a process from the axillary. The lateral edges are straight, diverging somewhat, and entirely free.

The axillaries are rhombic, the lateral angles slightly truncated and continuing the direction of the lateral edges of the IBr_1; the anterior angle and the posterior process incising the IBr_1 are about equally produced, and are similar; all four edges are slightly concave.

The first brachial is wedge shaped, with the proximal and distal edges slightly concave, and is about as broad as the external (greater) length; the internal length is not much more than half the external length; the internal edges are entirely free. The second brachial is larger than the first, irregularly quadrate. The third brachial is nearly twice as long interiorly as exteriorly, about as broad as the exterior lenght. The arms are not preserved beyond the syzygy between the third and fourth brachials.

The length of the specimen from the tip of the centrodorsal to the syzygy between the third and fourth brachials is 9 mm.

STATION LIST

SHOWING THE ASSOCIATION OF SPECIES AT THE DIFFERENT LOCALITIES.

STATION 33. Bay of Pidjot, Lombok. 22 Metres and less. Mud, coral and coral sand. *Capillaster multiradiata, Comatula micraster, Comantheria briareus, Comanthina schlegelii, Amphimetra jacquinoti.*

STATION 37. Sailus ketjil, Paternoster Islands. 27 Metres and less. Coral and coral sand. *Capillaster multiradiata, Comatula purpurea, Comaster minimus.*

STATION 38. Paternoster Islands (7° 35′.4 S., 117° 28′.6 E.). 521 Metres. Coral. *Psathyrometra inusitata, Psathyrometra* sp., *Pentametrocrinus japonicus.*

STATION 40. Anchorage off Pulu Kawassang, Paternoster Islands. 12 Metres. Coral reef. *Capillaster multiradiata, Comanthus parvicirra, Stephanometra echinus, Colobometra perspinosa.*

STATION 43. Anchorage off Pulu Sarassa, Postillon Islands. Down to 36 Metres. Coral. *Comatella nigra, Comanthus annulata, Comanthus parvicirra, Dichrometra flagellata.*

STATION 45. North of Sumbawa (7° 24′ S., 118° 15′.2 E.). 794 Metres. Fine grey mud, with some radiolarians and diatoms. *Thalassometra margaritifera, Psathyrometra major, Psathyrometra mira, Psathyrometra inusitata, Pentametrocrinus varians.*

STATION 47. Bima Bay, Sumbawa, near south fort. 55 Metres. Mud, with patches of fine coral sand. *Capillaster multiradiata.*

STATION 48. North of Sumbawa (8° 4′.7 S., 118° 44′.3 E.). 2060 Metres. Fine grey mud, in part green. *Psathyrometra minima, Pentametrocrinus varians.*

STATION 49ª. Sapeh Strait. 8° 23′.5 S., 119° 4′.6 E. 69 Metres. Coral and shells. *Capillaster multiradiata, Comatula purpurea, Comatula pectinata, Comantheria weberi, Catoptometra ophiura, Eudiocrinus serripinna, Liparometra articulata, Mariametra vicaria, Cyllometra gracilis, Eumetra aphrodite.*

STATION 50. Badjo Bay, western coast of Flores. Down to 40 Metres. Mud, sand or shells, according to locality. *Capillaster multiradiata, Comatula pectinata, Comantheria briareus, Comanthus samoana, Comanthus annulata, Petasometra clarae, Compsometra longicirra, Compsometra parviflora.*

STATION 51. Madura Bay, and other localities in the southern part of Molo Strait. 69—91 Metres. Fine grey sand; or coarse sand with shells and stones. *Mariametra tuberculata.*

STATION 52. Off the southwestern coast of Sumba (9° 3′.4 S., 119° 56′.7 E.). 959 Metres. Globigerina ooze. *Thaumatometra thysbe.*

STATION 58. Anchorage off Seba, Savu. Down to 27 Metres. Sand. *Comanthus parvicirra.*

STATION 59. Western entrance to Samau Strait (10° 22′.7 S., 123° 16′.5 E.). 390 Metres. Coarse coral sand with small stones. *Metacrinus varians.*

STATION 60. Haingsisi, Samau Island, Timor. Lithothamnion in 3 Metres and less; reef. *Capillaster multiradiata, Comatula purpurea, Comantheria briareus, Comanthus parvicirra, Lamprometra protectus.*

STATION 61. Lamakera, Solor Island. Reef. *Comatula purpurea.*

STATION 65a. West of Tanah Djampeah (south off Saleyer) (very near 7° 0′ S., 120° 34′.5 E.). From 400 Metres upward. Pale grey mud, changing during the haul into coral bottom. *Comaster distincta, Eudiocrinus indivisus, Compsometra parviflora.*

STATION 74. Off southwestern Celebes (5° 3′.5 S., 119° 0′ E.). 450 Metres. Globigerina ooze (obviously a thin layer). *Pentametrocrinus japonicus.*

STATION 77. Borneo Bank (3° 27′ S., 117° 36′ E.). 59 Metres. Fine grey coral sand. *Capillaster macrobrachius.*

STATION 78. Lumu-Lumu Shoal, Borneo Bank. 34 Metres. Coral and coral sand. *Comanthus parvicirra, Lamprometra protectus.*

STATION 79. Borneo Bank (2° 43′ S., 117° 44′ E.). 41—54 Metres. Fine coral sand. *Capillaster sentosa, Comatula pectinata.*

STATION 79a. Borneo Bank, 5 miles NNE. from Stat. 79 (2° 38′.5 S., 117° 46′ E.). 54 Metres. Fine coral sand. *Decametra minima, Toxometra paupera.*

STATION 79b. Pulu Kabala-dua, Borneo Bank. 22 Metres. Coral sand. *Comatula pectinata, Comanthus parvicirra, Lamprometra protectus.*

STATION 80. Borneo Bank (2° 25′ S., 117° 43′ E.). 50—40 Metres. Fine coral sand. *Colobometra discolor.*

STATION 81. Pulu Sebangkatan, Borneo Bank. 34 Metres. Coral and Lithothamnion. *Comanthus parvicirra, Stephanometra spinipinna, Lamprometra protectus.*

STATION 85. West of northern Celebes (0° 36′.5 S., 119° 29′.5 E.). 724 Metres. Fine grey mud. *Thalassometra hirsuta, Fariometra dione, Atelecrinus sulcatus.*

STATION 88. Off northwestern Celebes (0° 34′.6 N., 119° 8′.5 E.). 1301 Metres. Fine grey mud; the trawl brought up chiefly yellow mud. *Monachocrinus minimus, Bythocrinus nodipes.*

STATION 89. Pulu Kaniungan ketjil. 11 Metres. Coral. *Comatella stelligera, Comatella maculata, Comaster novaeguinea, Comanthus annulata, Stephanometra spinipinna, Stephanometra monacantha, Lamprometra protectus.*

STATION 90. North of Island Kaniungan, eastern coast of Borneo (1° 17′.5 N., 118° 53′ E.). 281 Metres. Coral sand and stones. *Capillaster multiradiata.*

STATION 93. Pulu Sanguisiapo, Tawi Tawi Islands, Sulu Archipelago. 12 Metres. Lithothamnion bottom; sand and coral. *Capillaster multiradiata.*

STATION 94. Tawi Tawi Islands (5° 11′.2 N., 119° 35′.4 E.). 450 Metres. Bottom apparently sand and stone. *Pectinometra magnifica, Democrinus weberi.*

STATION 95. Northwest of the Tawi Tawi Islands (5° 43′.5 N., 119° 40′ E.). 522 Metres. Stony bottom. *Comissia parvula, Cosmiometra philippinensis, Pentametrocrinus diomedeae, Metacrinus serratus, Metacrinus varians.*

STATION 96. Southeastern side of the Pearl Bank, Sulu (Joló) Archipelago. 15 Metres. Lithothamnion bottom. *Comatella stelligera, Comatella maculata, Comatula pectinata, Comantheria briareus, Comanthus parvicirra, Himerometra bartschi, Stephanometra monacantha, Lamprometra protectus, Toxometra paupera.*

STATION 97. North of the Tawi Tawi Islands (5° 48′.7 N., 119° 49′.6 E.). 564 Metres. Coarse coral sand. *Metacrinus varians, Metacrinus suluensis.*

STATION 99. Anchorage off North Ubian. (6° 7′.5 N., 120° 26′ E.). 16—23 Metres. Lithothamnion bottom. *Comatella nigra, Comatella stelligera, Capillaster multiradiata, Comatula purpurea, Comatula pectinata, Comantheria polycnemis, Comanthina schlegelii, Comanthus parvicirra, Heterometra affinis, Heterometra quinduplicava, Amphimetra discoidea, Stephanometra echinus, Stephanometra oxyacantha, Stephanometra spicata, Lamprometra protectus, Decametra mylitta, Compsometra parviflora, Toxometra paupera, Dorometra parvicirra.*

Same Station. Surface. *Comanthus parvicirra,* juv.

STATION 105. Sulu (Joló) Archipelago (6° 8′ N., 121° 19′ E.). 275 Metres. Coral bottom. *Palaeocomatella difficilis, Comissia parvula, Parametra granulata, Compsometra parviflora, Democrinus weberi.*

STATION 115. Eastern side of Pajunga Island, Kwandang Bay, Celebes. Shore. *Lamprometra protectus.*

STATION 117. Entrance to Kwandang Bay, Celebes (1° 0′.5 N., 122° 56′ E.). 80 Metres. Sand and coral. *Decametra minima, Pterometra venusta.*

STATION 119. East of northeastern Celebes (1° 33′.5 N., 124° 41′ E.). 1901 Metres. Stony bottom. *Fariometra scutifera.*

STATION 122. East of northeastern Celebes (1° 58′.5 N., 125° 0′.5 E.). 1264—1165 Metres. *Aglaometra valida, Poecilometra acoela, Strotometra ornatissima, Thaumatocrinus naresi, Hypalocrinus naresianus.*

STATION 124. Northeast of the northeastern point of Celebes (2° 27′ N., 125° 35′ E.). 1327 Metres. Bottom, rock. *Poecilometra acoela.*

STATION 125. Anchorage off Sawan, Siau Island. 27 Metres. Stone, and some Lithothamnion. *Comantheria briareus, Lamprometra protectus, Compsometra parviflora.*

STATION 129. Anchorage off Kawio and Kamboling Islands, Karkaralong Group. 23—31 Metres. Sand. *Comissia littoralis.*

STATION 131. Anchorage off Beo, Karakelang Islands. 13 Metres. *Comanthus parvicirra.*

Same Locality. Reef. *Comanthus parvicirra.*

STATION 133. Anchorage off Lirung, Salibabu Island. Down to 36 Metres. Mud and hard sand. *Capillaster multiradiata, Comanthus bennetti, Comanthus parvicirra.*

STATION 139. Northwest of Batjan, Moluccas (0° 11′ S., 127° 25′ E.). 397 Metres. Mud, stones and coral. *Euantedon moluccana.*

STATION 144. Anchorage north of Salomakiëe (Damar) Island. 45 Metres. Coral and Lithothamnion. *Capillaster multiradiata, Comatula purpurea, Comaster distincta, Comantheria briareus, Comanthus parvicirra, Eudiocrinus indivisus, Dichrometra flagellata, Decametra minima, Pterometra pulcherrima, Compsometra iris, Dorometra nana.*

STATION 149. Gebé Island; Fau anchorage and lagoon, on the western coast. 31 Metres. Coral. *Comanthus annulata, Colobometra perspinosa.*

STATION 150. West of Gebé Island, Moluccas (0° 6′ N., 129° 7′.2 E.). 1089 Metres. Yellow-grey mud and sand; stones. *Tonrometra brevipes.*

STATION 153. Northwest of Waigeu Island, northwest of Papua (0° 3′.8 N., 130° 24′.3 E.). 141 Metres. Fine and coarse sand, with dead shells. *Comaster distincta.*

STATION 161. West of Salawatti Island, west of Papua (1° 10′.5 S., 130° 9′ E.). 798 Metres. Muddy sand. *Aglaometra sulcata.*

STATION 162. Between Loslos and Broken Islands, western coast of Salawatti. 18 Metres. Coarse and fine sand, with clay and shells. *Capillaster multiradiata, Comatula pectinata, Comanthus samoana, Comanthus parvicirra, Zygometra comata.*

STATION 164. South of Salawatti (1° 42′.5 S., 130° 47′.5 E.). 32 Metres. Sand, small stones and shells. *Comatula pectinata, Comanthina schlegelii, Amphimetra jacquinoti, Lamprometra protectus, Oligometra serripinna, Tropiometra afra.*

STATION 166. West of Papua (2° 28′.5 S., 131° 3′.3 E.). 118 Metres. Hard coarse sand. *Capillaster tenuicirra, Daidalometra arachnoides, Monachometra fragilis.*

STATION 167. West of Papua (2° 35′.5 S., 131° 26′.2 E.). 95 Metres. Character of bottom not given. *Eudiocrinus junceus, Homalometra denticulata, Compsometra longicirra, Dorometra clymene.*

STATION 170. West of Papua (3° 37′.7 S., 131° 26′.4 E.). 924 Metres. Fine grey mud. *Psathyrometra mira.*

STATION 172. Anchorage between Gisser and Ceram Laut. 18 Metres. Coral and Lithothamnion bottom. *Comanthus parvicirra.*

STATION 173. Northeast of Ceram, Moluccas (3° 27′.0 S., 131° 0′.5 E.). 567 Metres. Fine yellow-grey mud. *Aglaometra vera, Nanometra clymene, Democrinus weberi.*

STATION 174. Waru Bay, northern coast of Ceram. 18 Metres. Mud. *Lamprometra protectus.*

STATION 177. Off southwestern Misool (2° 24′.5 S., 129° 38′.5 E.). 1633—1300 Metres. Dead coral and stones covered with manganese. *Atopocrinus sibogae, Atelecrinus anomalus.*

STATION 178. North of Ceram (2° 40′ S., 128° 37′.5 E.). 835 Metres. Blue mud. *Psathyrometra inusitata.*

STATION 179. Kawa Bay, western coast of Ceram. 36 Metres. Stony bottom. *Zygometra comata.*

STATION 181. Amboina. *Comaster novaeguineae, Lamprometra protectus, Petasometra clarae.*

STATION 193. Sanana Bay, eastern coast of Sula Besi. 22 Metres. Mud. *Lamprometra protectus.*

STATION 209. Anchorage off the southern point of Kabaëna Island. 22 Metres. Coarse sand. *Comanthus annulata, Himerometra magnipinna, Lamprometra protectus.*

STATION 211. Southeast of Sindjai, Celebes (5° 40′.7 S., 120° 45′.5 E.). 1158 Metres. Coarse grey mud, the superficial layer more fluid and brown. *Stiremetra perplexa, Psathyrometra anomala, Nepiometra io, Pentametrocrinus semperi, Bythocrinus nodipes.*

STATION 213. Saleyer, Reef. *Comatella maculata, Comanthus annulata, Dichrometra flagellata, Decametra laevipinna.*

STATION 220. Anchorage off Pasir Pandjang, western coast of Binongka. 278 Metres. Coral sand. *Dorometra gracilis.*

Same Locality. Reef. *Comanthina schlegelii.*

STATION 226. Mid-channel between the Lucipara and Schildpad Islands (10° 26′.7 S., 127° 36′.5 E.). 1595 Metres. Hard bottom; nothing but small stones came up in the dredge. *Crotalometra marginalis.*

STATION 234. Nalahia Bay, Nusa Laut Island. 46 Metres. Stony bottom. *Comanthus parvicirra.*

STATION 240. Banda. 9—36 Metres. *Capillaster sentosa, Capillaster multiradiata, Comaster multibrachiata, Comaster parvus, Comantheria briareus, Comanthus bennetti, Comanthus parvicirra, Colobometra perspinosa, Compsometra parviflora.*

Same locality. Reef. *Comanthus parvicirra.*

STATION 241. North of Banda (4° 24′.3 S., 129° 49′.3 E.). 1570 Metres. Dark sand with small stones. *Bythocrinus nodipes, Monachocrinus poculum.*

STATION 248. Anchorage off Rumah Lusi, northern point of Tiur Island. Down to 54 Metres. Character of bottom not recorded. *Lamprometra protectus.*

STATION 250. Anchorage off Kilsuin, western coast of Kur Island. 20—45 Metres. Coral and Lithothamnion. *Capillaster multiradiata, Comatula purpurea, Stephanometra monacantha, Dichrometra flagellata, Dorometra nana.*

STATION 251. North of the Kei Islands (5° 28′.4 S., 132° 0′.2 E.). 204 Metres. Hard coral sand; the trawl brought up pieces of grey clay and manganese nodules, the interior of which consisted of dry clay. *Oceanometra magna, Nanometra clymene, Nepiometra alcyon, Metacrinus acutus, Metacrinus cingulatus, Metacrinus nobilis, Metacrinus superbus.*

STATION 253. Kei Islands (5° 48′.2 S., 132° 13′ E.). 304 Metres. Grey clay, hard and crumbly. *Cosmiometra philippinensis, Nanometra clymene, Metacrinus acutus, Metacrinus varians, Metacrinus nobilis.*

STATION 254. Kei Islands (5° 40′ S., 132° 26′ E.). 310 Metres. Fine grey mud. *Cosmiometra philippinensis, Crossometra helius, Perissometra gorgonia, Strotometra parvipinna, Nanometra clymene, Metacrinus acutus, Metacrinus nobilis, Metacrinus superbus.*

STATION 257. Du-roa Strait, Kei Islands. Down to 52 Metres. Coral. *Comaster pulcher, Comantheria briareus, Eudiocrinus indivisus.*

STATION 258. Tual Anchorage, Kei Islands. 22 Metres. Lithothamnion, sand and coral. *Oligometra serripinna.*

STATION 259. Kei Islands (5° 29′.2 S., 132° 52′.5 E.). 487 Metres. Coral sand and dead coral. *Perissometra crassa.*

STATION 260. 2.3 miles N. 63° W. from the northern point of Nuhu Jaan, Kei Islands (5° 36′.5 S., 132° 55′.2 E.). 90 Metres. Sand, coral and shells. *Comissia lütkeni, Comissia hispida, Comaster distincta, Eudiocrinus indivisus, Decametra parva, Decametra minima, Cotylometra gracilicirra, Neometra diana, Asterometra mirifica, Asterometra longicirra.*

STATION 266. Kei Islands (5° 56′.5 S., 132° 47′.7 E.). 595 Metres. Grey mud with coral and stones. *Comissia gracilipes, Strotometra priamus.*

STATION 267. Kei Islands (5° 54′ S., 132° 56′.7 E.). 984 Metres. Grey mud with a brown upper layer. *Comissia gracilipes, Comatulides australis.*

STATION 273. Anchorage off Pulu Jedan, eastern coast of the Aru Islands (Pearl Banks). 13 Metres. Sand and shells. *Capillaster multiradiata, Comatula rotalaria, Comatula etheridgei, Comatula purpurea, Comatula pectinata, Comantheria rotula, Comanthus annulata, Comanthus parvicirra, Zygometra microdiscus, Zygometra punctata, Heterometra crenulata, Amphimetra discoidea, Oligometrides adeonae, Oligometra carpenteri.*

STATION 274. Off the northeastern part of the Aru Islands (5° 28′.2 S., 134° 53′.9 E.). 57 Metres. Sand and shells; stones. *Capillaster multiradiata, Comatula purpurea, Comaster parvus, Heterometra crenulata, Oligometra carpenteri.*

STATION 279. Rumah Kuda Bay, Roma Island. 36 Metres. Mud and Sand. *Lamprometra protectus.*

STATION 282. Anchorage between Nusa Besi and the northeastern point of Timor (8° 25′.2 S., 127° 18′.4 E.). 27—54 Metres. Sand, coral and Lithothamnion. *Comatella nigra, Capillaster multiradiata, Comatula purpurea, Comatula pectinata, Comaster fruticosus, Comaster delicata, Comantheria briareus, Comantheria rotula, Comanthus parvicirra.*

STATION 284. Timor (8° 43′.1 S., 127° 16′.7 E.). 828 Metres. Grey mud. *Democrinus weberi.*

STATION 285. Southern coast of Timor (8° 39′.1 S., 127° 4′.4 E.). 34 Metres. On the dividing line between mud and coral. *Capillaster multiradiata, Comatula purpurea, Comatula pectinata.*

STATION 286. Timor (8° 50′.2 S., 127° 2′.2 E.). 883 Metres. Mud, evidently a thin layer. *Thalassometra hirsuta.*

STATION 289. Timor (9° 9′.3 S., 126° 24′.5 E.). 112 Metres. Mud, sand and shells. *Comaster distincta, Eudiocrinus venustulus, Compsometra parviflora, Democrinus weberi.*

STATION 294. Timor (10° 12′.2 S., 124° 27′.3 E.). 73 Metres. Soft mud with very fine sand. *Capillaster multiradiata, Comissia parvula, Comatula pectinata, Comaster parvus, Comaster distincta, Comanthus parvicirra, Catoptometra ophiura, Eudiocrinus venustulus, Eudiocrinus ornatus, Mariametra tenuipes, Neometra diana, Asterometra mirifica, Daidalometra arachnoides, Perissometra gorgonia, Eumetra aphrodite.*

STATION 295. Timor (10° 35′.6 S., 124° 11′.7 E.). 2050 Metres. Fine grey mud 3 cm. thick, the upper layer more fluid, brown with black stripes. *Democrinus weberi.*

STATION 296. Anchorage off Noimini, South coast of Timor. Coral Reef. *Capillaster multiradiata.*

STATION 297. Timor (10° 39′ S., 123° 40′ E.). 520 Metres. Soft grey mud with a brown upper layer. *Comatulides australis, Crossometra investigatoris, Perissometra robusta, Perissometra timorensis, Chondrometra rugosa, Chondrometra robusta, Strotometra parvipinna, Strotometra priamus, Democrinus weberi, Eudoxocrinus sibogae, Metacrinus cingulatus, Metacrinus nobilis* var. *timorensis.*

STATION 299. Boeka (or Cyrus) Bay, southern coast of Rotti Island (10° 52′.4 S., 123° 1′.1 E.). 34 Metres. Mud, coral and Lithothamnion. *Capillaster sentosa, Capillaster multiradiata, Comatula purpurea, Comatula pectinata, Comantheria briareus, Comanthus bennetti, Comanthus samoana.*

STATION 301. Pepela Bay, eastern coast of Rotti Island (10° 38′ S., 123° 25′.2 E.). 22 Metres. Mud, coral and Lithothamnion. *Comatula purpurea, Stephanometra indica.*

STATION 302. Near Rotti Island (10° 27′.9 S., 125° 28′.7 E.). 216 Metres. Sand and coral sand. *Comissia parvula, Comaster minimus, Parametra compressa.*

STATION 303. Haingsisi, Samau Island. Down to 36 Metres. Lithothamnion. *Comanthina schlegelii.*

STATION 305. Mid-channel in Solor Strait, off Kampong Menanga. 113 Metres. Stony. *Comissia lütkeni, Comissia spinosissima, Comaster distincta, Eudiocrinus indivisus, Cyllometra manca, Oligometrides adeonae, Cotylometra gracilicirra, Neometra sibogae, Neometra alecto.*

STATION 310. Eastern coast of Sumbawa (8° 30′ S., 119° 7′.5 E.). 73 Metres. Sand, with a few pieces of dead coral. *Comanthus parvicirra, Eudiocrinus pinnatus, Eudiocrinus serripinna, Pontiometra andersoni, Colobometra discolor*

STATION 314. Paternoster Islands (7° 36′ S., 117° 30′.8 E.). 694 Metres. Fine sandy mud. *Psathyrometra inusitata, Pentametrocrinus varians.*

STATION 315. Anchorage east of Sailus Besar, Paternoster Islands. Down to 36 Metres. Coral and Lithothamnion. *Comanthus parvicirra, Decametra parva.*

STATION 316. Paternoster Islands (7° 19′.4 S., 116° 49′.5 E.). 538 Metres. Fine dark brown sandy mud. *Comaster multibrachiata, Psathyrometra inusitata.*

STATION 318. Between Borneo and eastern Java (6° 36′.5 S., 114° 55′.5 E.). 88 Metres. Fine yellowish grey mud. *Capillaster gracilicirra, Capillaster tenuicirra, Comatula purpurea, Comaster sibogae, Heterometra propinqua, Dichrometra tenuicirra.*

STATION 319. Between Borneo and eastern Java (6° 16′.5 S., 114° 37′ E.). 82 Metres. Fine yellowish grey mud. *Capillaster tenuicirra.*

STATION 320. Between Borneo and eastern Java (6° 5′ S., 114° 7′ E.). 82 Metres. Fine grey mud. *Capillaster gracilicirra, Capillaster tenuicirra, Comatula tenuicirra, Heterometra propinqua, Oxymetra tenuicirra, Dichrometra tenuicirra.*

STATION 322. One and one half miles south of Tandjong Lajar, southern coast of Bawean Island. 32 Metres. Coral. *Comatella stelligera, Comanthus annulata, Zygometra comata.*

Batavia Bay, Java. *Comanthina schlegelii.*

Enkhuizen Island (near Batavia). *Comatella nigra, Stephanometra oxyacantha.*

Maumeri, Flores. Coral Reef. *Comaster novaeguinea, Comanthus parvicirra, Toxometra paupera.*

THE INORGANIC CONSTITUENTS OF THE SKELETONS

OF ZYGOMETRA MICRODISCUS AND OF CHONDROMETRA RUGOSA.

At my request Professor FRANK W. CLARKE of the United States Zoological Survey made detailed analyses of fragments of the arms of a specimen of *Zygometra microdiscus* (Bell) from the Aru Islands in 13 metres of water (Stat. 273), and also of a specimen of *Chondrometra rugosa* (A. H. Clark) from the southern coast of Timor in 520 metres (Stat. 297).

It is a very curious fact, first discovered by Professor CLARKE in making a series of analyses for me, that in the crinoid skeleton the proportion of magnesium carbonate ($MgCO_3$), which is always found in conjunction with the calcium carbonate ($CaCA_3$), varies according to the temperature of the habitat, quite regardless of the systematic position of the animals. Thus in the skeletons of the crinoids living in water having a temperature of from — 1.8° to + 1.5° C. the percentage of magnesium carbonate is from 7.28 to 8.23, while in the littoral crinoids of the Philippine Islands the percentage is from 12.20 to 12.69. In water of intermediate temperatures intermediate percentages are found.

This holds good not only for the crinoids, but for all other echinoderms as well, and indeed apparently for all other marine animals which have a strictly internal calcareous skeleton — alcyonarians, most foraminifera, etc.

The actual analyses of the skeletons of *Zygometra microdiscus* and of *Chondrometra rugosa*, which were made by Mr. W. C. WHEELER under the direction of Professor CLARKE, gave the following results:

	Zygometra microdiscus	*Chondrometra rugosa*
SiO_2	0.04	0.05
R_2O_3 [1]	0.48	0.23
MgO	4.92	3.99
CaO.	37.19	42.72
P_2O_5	0.17	Trace
Loss on ignition	55.05	51.69
CO_2 needed . .	34.47	37.95

1) The symbol "R_2O_3" represents the sum of ferric oxide and alumina, and "Loss on ignition" covers carbon dioxide, water and organic matter.

The CO_2 calculated to satisfy the bases is given.

Eliminating the highly variable organic matter and recalculating to 100%, the analyses assume the following form:

	Zygometra microdiscus	*Chondrometra rugosa*
SiO_2	0.05	0.06
R_2O_3	0.62	0.27
$MgCO_3$	13.37	9.87
$CaCO_3$	85.48	89.80
$Ca_3P_2O_8$	0.48	Trace
	100.00	100.00

The skeleton of *Zygometra microdiscus* contains the highest percentage of $MgCO_3$ of any of which analyses have been made. The percentage of $MgCO_3$ in the skeleton of *Chondrometra rugosa* is what would be assumed from the temperature of its habitat.

INDEX.

The following index includes all the scientific names mentioned in the preceding pages, excepting in the introduction.

Synonyms are given in italics.

This index, in combination with the synonymy given under each species, furnishes a key to everything which has been published dealing with the comatulids of the East Indian region. The few East Indian species of which the synonymy is not given may be readily traced to the original citations through reference to "The Crinoids of the Indian Ocean".

abyssicola, *Antedon* 254.
Bathymetra 254 (in key), **254**.
abyssorum, *Antedon* 256.
Promachocrinus 259, footnote.
Thaumatometra 255 (in key), **256**.
acanthaster, Neometra 132 (in key).
acerba, Asterometra 141 (in key).
acoela, *Antedon* 190.
Poecilometra 190 (in key), **190**, 273.
Actinometra affinis 30.
albonotata 26, footnote.
annotea 55.
annulata 53.
armata 55.
aruensis 25.
bennetti 50.
borneensis 15.
brachymera 50.
briareus 44.
coppingeri 15.
cristata 4, footnote.
cumingi 55.
cumingii 55.
difficilis 7, 8, 9.
dissimilis 46.
distincta 41.
divaricata 43, footnote, 44.
duplex 46.
elongata 55, 56.
fimbriata 15.
fusca 7.
gracilis 15.
Actinometra grandicalyx 51.
guttata 55.
imperialis 26, footnote.
intermedia 26, footnote.
intricata 53, 55.
jukesi 25.
jukesii 25.
litoralis 53.
littoralis 53.
macrobrachius 10.
maculata 6, 7, 97.
meyeri 53.
multibrachiata 39.
multifida 38, 46.
multiradiata 7, 11, 15, 50.
mutabilis 55.
nigra 5.
nobilis 46, 47.
notata 5.
novae-guineae 38, 39.
parvicirra 30, 41, 44, 46, 52, 53, 55, 56.
parvicurva 56.
paucicirra 25.
pectinata 30.
peronii 50.
polymorpha 55.
pulchella 8, 9.
quadrata 55, 56.
regalis 38, 39, 46, 47.
robusta 26, footnote.
robustipinna 51.
rotalaria 55.

Actinometra schlegelii 46.
sentosa 11.
simplex 7, 55.
solaris 30.
stellata 35, footnote, 37.
stelligera 5.
stewarti 15.
strata 26, footnote.
strota 26, footnote.
tenax 5.
trachygaster 54, 55.
typica 38, 47.
valida 53.
variabilis 35, footnote, 38, 55.
sp. 6, 7, 30, 46, 55.
Actinometra (Comatula) armata 55.
aculeata, Chondrometra 188 (in key), 189.
acuta, *Himerometra* 93, footnote, 96.
Stenometra 157.
acutiradia, *Antedon* 161.
Stiremetra 161 (in key), **161**.
acutus, Metacrinus 274.
Adelometra 222 (in key), **233**.
Adelometra angustiradia 233 (in key), **233**.
tenuipes 233 (in key), **233**.
adeonae, *Antedon* 126.
Comatula 126.
Oligometra 126.
Oligometrides 46, **126**, 275, 276.
adrestine, *Antedon* 212.
Iridometra 212 (in key), **212**.
adriatica, Antedon 203 (in key).
aegyptica, Dorometra 215 (in key), **217**.
Iridometra 217.
aequipinna, *Antedon* 100, footnote, 100.
affinis, *Actinometra* 30.
Antedon 82.
Heterometra 79 (in key), **82**, 272.
afra, *Antedon* 132.
Dichrometra 105 (in key).
Perometra 234 (in key), **234**.
Tropiometra 131 (in key), **132**, 273.
africana, Heterometra 77 (in key).
agassizii, *Antedon* 170.
Thalassometra 167 (in key), **170**.
Aglaometra 146 (in key), **163**.
Aglaometra eupedata 163 (in key), **164**.
incerta 163 (in key), **165**.
propinqua 163 (in key), 164, 165, **166**.
sulcata 163 (in key), **164**, 273.
valida 163 (in key), **164**, 273.
vera 163 (in key), 164, **165**, 274.
alascana, Psathyrometra 223 (in key), **226**.
alata, Neocomatella 9.
alaudae, Decametra 117 (in key).
alboflava, *Antedon* 160.
Lissometra **160**.
albonotata, *Actinometra* 26, footnote.
albopurpurea, Cyllometra 115 (in key), 115, 116.
alcyon, Nepiometra 251 (in key), **251**, 274.
Thaumatometra 251 (in key).
Alecto bennetti 50.
dentata 246.
elongata 104, footnote, 106.
flagellata 106.
novae-guineae 37.
parvicirra 54.
purpurea 27.
sarsii 246.
tessellata 90, 91.
timorensis 54.
alecto, *Calometra* 137.
Neometra 133 (in key), **137**, 276.
aliena, *Craspedometra* 77, footnote, 80, 81.
alternans, Comantheria 43 (in key).
Comanthus 44.
alternata, *Antedon* 252, 253, 256.
Thaumatometra 255 (in key), **256**.
amboinae, *Craspedometra* 78, footnote.
Heterometra 78 (in key), 78, footnote.
amboinensis, *Antedon* 100, footnote, 100.
Amphimetra 73 (in key), **82**.
Amphimetra anceps 81.
crenulata 80.
denticulata 91.
discoidea 83 (in key), 85, **87**, 88, 89, 90, 272, 275.
ensifer 83 (in key), **88**.
ensiformis 88.
formosa 87.
jacquinoti 83 (in key), 84, **85**, 271, 273.
laevipinna 83 (in key), **88**, 90.
laevissima 84, 87.
milberti 83, 84, 85, 86, 87, 88, **89**, 90.
molleri 82 (in key), 83, **84**, 86, 90.
mortenseni 77, footnote.
papuensis 83 (in key), 87, **89**.
parilis 82 (in key), **84**.
pinniformis 83 (in key), **89**.
propinqua 80.
schlegelii 88, 89.
sinensis **90**.
spectabilis 82 (in key), **83**.
tessellata **90**.
variipinna 77, footnote, 80.
Analcidometra 111 (in key).
anceps, *Amphimetra* 81.
Antedon 76, footnote, 81.
Craspedometra 80, 81.
Himerometra 79, 87.

andersoni, *Antedon* 98.
Pontiometra **98**, 276.
andromeda, Zygometra 59 (in key).
Andrometra 198 (in key), **210**.
Andrometra indica 210 (in key), **210**.
psyche 210 (in key), **210**.
angusticalyx, *Antedon* 178, 187.
Pachylometra 178.
Perissometra 176 (in key), **178**.
angustiradia, Adelometra 233 (in key), **233**.
Antedon 233.
anisa, Oligometra 126.
annandalei, *Crotalometra* 153.
Oceanometra 151 (in key), 153, **153**.
Thalassometra 153.
annotea, Actinometra 55.
annulata, *Actinometra* 53.
Comanthus 50 (in key), 271, 272, 273, 274, 275, 276.
Comanthus (Vania) **53**.
annulatum, Comanthus 53.
annulatum, xanthum, Comanthus 53.
anomala, Psathyrometra 225 (in key), **230**, 274.
anomalus, Atelecrinus 266 (in key), **269**, 270, 274.
antarctica, Psathyrometra 225 (in key), **230**.
Antedon 197 (in key), **203**.
Antedon *abyssicola* 254.
abyssorum 256.
acoela 190.
acutiradia 161.
adeonae 126.
adrestine 212.
adriatica 203 (in key).
aequipinna 100, footnote, 100.
affinis 82.
afra 132.
agassizii 170.
alboflava 160.
alternata 252, 253, 256.
amboinensis 100, footnote, 100.
anceps 76, footnote, 81.
andersoni 98.
angusticalyx 178, 187.
angustiradia 233.
articulata 103.
asperrima 243.
aster 155.
balanoides 233.
bassett-smithi 6.
bidens 126.
bidentata 77, footnote, 79.
bifida 203 (in key).
bigradata 226.
bispinosa 170.
bowersi 239.
Antedon *brevicirra* 41.
brevicuneata 100, footnote, 101.
brevipinna 187.
brevipinna var. coronata 187.
decora 187.
diadema 187.
elegans 187.
gracilis 187.
granulosa 187.
laevis 187.
ornata 187.
pulchra 187.
spinosa 187.
tuberosa 187.
breviradia 161.
briareus 44.
briseis 216.
brockii 76, footnote.
carinata 130.
carpenteri 130.
ciliata 256.
clarae 113.
clemens 76, footnote, 81.
clio 244.
columnaris 231.
comata 61.
compressa 158, 160.
conifera 154.
conjungens 100, footnote, 100.
crassipinna 74.
crenulata 79.
cubensis 220, 247.
decipiens 77, footnote, 79.
defecta 236.
denticulata 91.
diadema 157.
diomedeae 234.
distincta 185.
dübenii 204 (in key).
dubia 77, footnote, 79.
duplex 154, 160.
echinata 171.
elegans 61.
elongata 106.
erythrizon 226.
eschrichti 240.
eschrichti var. *magellanica* 242.
eversa 161.
exigua 246.
fimbriatus 15.
flagellata 106.
flava 149.
flavomaculata 93, footnote, 96.
flexilis 182.
fluctuans 59, footnote.

Antedon *fragilis* 226.
garrettiana 190.
gracilis 170.
granulifera 187.
hagenii 220, 221.
hana 157.
hawaiiensis 170.
hepburniana 194.
hirsuta 232.
hondoensis 243.
hupferi 203 (in key).
hystrix 246.
imparipinna 100, footnote, 100, 101.
inaequalis 184.
incerta 165.
incommoda 208.
indica 100.
inexpectata 243.
informis 123.
insignis 123, footnote, 124.
irregularis 30, 77, footnote, 79.
isis 248.
jacquinoti 85.
klunzingeri 100, footnote.
laevicirra 100, footnote.
laevipinna 88.
laevis 252.
laevissima 84, 87.
laodice 243.
lata 182.
latipinna 170.
lepida 100, footnote, 100.
longicirra 141, 142.
longipinna 253.
lovéni 123, footnote, 124, 209, 210.
lusitanica 171.
magellanica 242.
magnicirra 150.
magnicirrus 150.
magnicrinus 150.
manca 115.
marginata 94, footnote, 95.
mariae 243.
mediterranea 202, 203 (in key).
mertensi 55.
microdiscus 60.
milberti 84, 85, 87, 89, 130.
minor 239.
minuta 212.
moluccana 201.
monacantha 96, 97.
moroccana 204 (in key).
multiradiata 59, footnote, 60.
multispina 171.
nana 216.
Antedon *occulta* 100, footnote, 100.
okelli 100, footnote, 101.
omissa 171.
orientalis 239.
orion 160.
oxyacantha 94.
palmata 97, 100, 101.
parvicirra 216.
parvipinna 194.
parvula 253.
patula 179.
perplexa 243.
perspinosa 124.
petasus 199, 204 (in key), 211.
pinniformis 89, 126.
polypus 98.
porrecta 149.
pourtalesi 187.
prolixa 246.
protecta 100.
protectus 96, 100.
psyche 210.
pubescens 170.
pulcher 104, footnote.
pumila 123, footnote, 208, 209, 210.
pusilla 234.
quinduplicava 81.
quinquecostata 157.
radiospina 161.
rathbuni 243.
reginae 103.
remota 259.
rhomboidea 242, 243.
robusta 179.
rosacea 243.
ruber 236.
sclateri 185.
serrata 209.
serratissima 243.
serripinna 130.
similis 100, footnote, 100, 101.
sinensis 90.
spicata 95.
spinicirra 161.
spinifera 156.
spinipinna 95.
stylifer 104, footnote.
subtilis 100, footnote, 101.
tanneri 243.
tenelloides 218,
tenera 100, footnote.
tenuicirra 218.
tenuis 256.
tessellatus 91.
tuberculata 94, footnote, 95.

Antedon *tuberosa* 190.
valida 164.
variipinna 77, footnote, 79.
variispina 108.
vicaria 108.
villosa 170.
wood-masoni 155.
sp. 81, 98, 115, 256.
sp. nov. 208.
Antedon (Comatula) milberti 89.
Antedon (Crotalometra) flava 149.
lusitanica 171.
porrecta 149.
ANTEDONIDAE **196**.
Antedoninae 196 (in key), **197**.
Anthometra 239, **240**.
anthus, Asterometra 141 (in key).
aphrodite, Eumetra 213 (in key), **213**, 271, 275.
Iridometra (Eumetra) 213.
arabica, Decametra 117 (in key).
arachnoides, Daidalometra 157 (in key), **157**, 273, 275.
Stenometra 157.
aranea, Oxymetra 99 (in key).
archeri, Kallispongia 209.
armata, Actinometra 55.
Actinometra (Comatula) 55.
articulata, *Antedon* 103.
Comatula (Alecto) 103.
Dichrometra 103.
Liparometra 103 (in key), **103**, 271.
aruensis, Actinometra 25.
Craspedometra 80.
aspera, Heterometra 79 (in key).
Trichometra 247.
asperrima, *Antedon* 243.
Florometra 241 (in key), **243**, 244.
aster, *Antedon* 155.
Cosmiometra 154 (in key), **155**.
Thalassometra 155.
Asterias *multiradiata* 14.
pectinata 14, 30.
tenella 246.
Asterometra 140 (in key), **140**.
Asterometra acerba 141 (in key).
anthus 141 (in key).
cristata 141 (in key), 142.
lepida 140 (in key), 142.
longicirra 141 (in key), **142**, 275.
macropoda 141 (in key).
mirifica 141 (in key), **141**, 142, 275.
pulcherrima 145.
ATELECRINIDAE **262**, 266.
Atelecrinus 262 (in key), 263, 264, 266, **266**, 269.
Atelecrinus anomalus 266 (in key), **269**, 270, 274.
balanoides 247, 267 (in key), 270.
Atelecrinus conifer 266 (in key), 270.
cubensis 247, 267, footnote.
helgae 267.
pourtalesi 267, footnote.
sulcatus 266, 267 (in key), **267**, 268, 272.
wyvillii 267 (in key), 268.
ater, Heterometra 78 (in key).
atlanticus, Pentametrocrinus 261 (in key).
Atopocrinus 262 (in key), **262**, 266.
Atopocrinus sibogae **263**, 274.
attenuata, Thalassometra 168 (in key), **171**.
audouini, Tropiometra 131 (in key).
australis, Comatulides 32 (in key), **32**, 275.
Cominia 32.
Erythrometra 235 (in key), **235**.
Austrometra 111 (in key).

balanoides, *Antedon* 233.
Atelecrinus 247, 267 (in key), 270.
Balanometra 232 (in key), **233**.
Balanometra 222 (in key), **232**.
Balanometra balanoides 232 (in key), **233**.
elongata 232 (in key), **232**.
bartschi, Himerometra 73 (in key), **75**, 272.
basicurva, Charitometra 191 (in key).
bassett-smithi, Antedon 6.
Bathymetra 246 (in key), **253**.
Bathymetra abyssicola 254 (in key), **254**.
brevicirra 257.
carpenteri 254 (in key), **254**.
minutissima 248.
Bathymetrinae 197 (in key), 230, 244.
belli, Comaster 35 (in key), 38.
bengalensis, Heterometra 79 (in key).
Heterometra 61, 63.
benhami, Comanthus 49 (in key).
bennetti, *Actinometra* 50.
Alecto 50.
Comanthus 48 (in key), 51, 273, 274, 275.
Comanthus (Bennettia) 51.
(Cenolia) **50**.
(Comanthus) 51.
Comatula 50.
bidens, Antedon 126.
Oligometra 126.
bidentata, Antedon 77, footnote, 79.
bifida, Antedon 203 (in key).
bigradata, *Antedon* 226.
Psathyrometra 224 (in key), **226**.
bimaculata, Dichrometra 104 (in key).
bispinosa, *Antedon* 170.
Thalassometra 166 (in key), **170**.
borealis, Psathyrometra 223 (in key), **226**.
Thaumatocrinus 259 (in key), **260**.
borneensis, Actinometra 15.

borneensis, Comatula (Actinometra) 15.
bowersi, *Antedon* 239.
Nanometra 237 (in key), **239**.
brachymera, Actinometra 50.
brachypecha, Antedon 41.
Bathymetra 257.
Comatula 54, 55.
Decametra 118 (in key).
Lamprometra 100, footnote, 101.
Thaumatometra 255 (in key), 257.
brevicuneata, Antedon 100, footnote, 100, 101.
brevipes, Tonrometra 258 (in key), **258**, 273.
Trichometra 258.
brevipinna, Antedon 187.
brevipinna var. coronata, Antedon 187.
decora, Antedon 187.
diadema, Antedon 187.
elegans, Antedon 187.
gracilis, Antedon 187.
granulosa, Antedon 187.
laevis, Antedon 187.
ornata, Antedon 187.
pulchra, Antedon 187.
spinosa, Antedon 187.
tuberosa, Antedon 187.
Comatula 186.
breviradia, *Antedon* 161.
Stiremetra 161 (in key), **161**.
briareus, *Actinometra* 44.
Antedon 44.
Comantheria 43 (in key), **44**, 45, 271, 272, 273, 274, 275.
Comanthus 44.
Comanthus (Comanthus) 44.
briseis, *Antedon* 216.
Dorometra 215 (in key), **216**.
brockii, Antedon 76, footnote.
Bythocrinus nodipes 272, 274.

caledoniae, Oligometra 130 (in key), 130.
callipecha, Lamprometra 100, footnote, 101.
callipeplum, Comanthus 43, footnote, 44.
Calometra 195.
Calometra *alecto* 137.
diana 133.
discoidea 133.
magnifica 138 (in key), **138**.
CALOMETRIDAE 132.
Calyptometra 174 (in key), **189**.
Calyptometra lateralis **189**, 195.
Capillaster 2 (in key), **9**, 18.
Capillaster clarki 10 (in key), 15, 18.
coccodistoma 10 (in key).
gracilicirra 10 (in key) **11**, 276.
macrobrachius 9 (in key), **10**, 272.
Capillaster mariae 10 (in key).
multiradiata 10 (in key), 13, **14**, 18, 271, 272, 273, 274, 275.
sentosa 10 (in key), **11**, 272, 274, 275.
tenuicirra 10 (in key), 11, **12**, 273, 276.
Capillasterinae 1 (in key), 2 (in key), **2**.
carduum, Pectinometra 138 (in key).
carinata, *Antedon* 130.
Comatula 88.
Tropiometra 131 (in key).
carinifera, Stiremetra 161 (in key), **161**.
carpenteri, *Antedon* 130.
Bathymetra 254 (in key), **254**.
Oligometra 129 (in key), **130**, 275.
Catoptometra **63**.
Catoptometra hartlaubi 63 (in key).
magnifica 63 (in key), 64.
ophiura 63 (in key), **64**, 271, 275.
rubroflava 63 (in key), 64.
celtica, Leptometra 80, 231 (in key).
Cenolia 48 (in key).
Cenometra 34, 111 (in key).
chadwicki, Comissia 19 (in key).
Prometra 125 (in key).
chamberlaini, Eumetra 213 (in key), **213**, 214.
Charitometra 172, (in key), **191**.
Charitometra basicurva 191 (in key).
distincta 176.
imbricata 187.
incisa 191 (in key).
lata 182.
lateralis 189.
smithi 184, footnote, 185.
CHARITOMETRIDAE 171.
chinensis, Oligometra 130 (in key).
chinensis perlegens, Stella 14.
Chlorometra 174 (in key), **190**.
Chlorometra garrettiana **190**.
robusta 189.
Chondrometra 172 (in key), **187**.
Chondrometra aculeata 188 (in key), 189.
robusta 188 (in key), 188, **189**, 275.
rugosa 187 (in key), **188**, 275, 277, 278.
ciliata, *Antedon* 256.
Dichrometra 105 (in key).
cingulatus, Metacrinus 274, 275.
clarae, *Antedon* 113.
Petasometra 113 (in key), **113**, 271, 274.
clarki, Capillaster 10 (in key), 15, 18.
clemens, Antedon 76, footnote, 81.
clio, *Antedon* 244.
Cyclometra 244 (in key), **244**.
clymene, Dorometra 215 (in key), **217**, 273.
Nanometra 237 (in key), **237**, 274.
coccodistoma, Capillaster 10 (in key).

Coccometra 217 (in key), **218**.
Coccometra guttata 218 (in key), **219**.
hagenii 219 (in key), **221**.
nigrolineata 219 (in key), **220**, 247.
Colobometra 68, 112 (in key), **123**.
Colobometra diadema 123 (in key).
discolor 123 (in key), **124**, 272, 276.
perspinosa 123 (in key), **124**, 271, 273, 274.
suavis 123 (in key).
vepretum 123 (in key).
COLOBOMETRIDAE 90, **110**, 266.
columnaris, *Antedon* 231.
Zenometra **231**.
Comactinia 24 (in key), 32.
Comactiniinae 2 (in key), **24**.
Comantheria 34 (in key), **42**.
Comantheria alternans 43 (in key).
briareus 43 (in key), **44**, 45, 271, 272, 273, 274, 275.
grandicalyx 43 (in key).
imbricata 43 (in key).
intermedia 43 (in key), 46.
magnifica 43 (in key).
polycnemis 43 (in key), **43**, 272.
rotula 43 (in key), **44**, 275.
weberi 43 (in key), 45, **46**, 271.
Comanthina 34 (in key), **46**.
Comanthina schlegelii 38, **46**, 271, 272, 273, 274, 276.
Comanthus 18, 34 (in key), **48**, 137.
Comanthus *alternans* 44.
annulata 50 (in key), 271, 272, 273, 274, 275, 276.
annulatum 53.
annulatum xanthum 53.
benhami 49.
bennetti 48 (in key), 51, 273, 274, 275.
briareus 44.
callipeplum 43, footnote, 44.
crassicirra 51.
divaricata 44.
duplex 47.
intricata 53.
japonica 49 (in key), 51.
luteofuscum 56.
nobilis 47.
parvicirra 50 (in key), 56, 271, 272, 273, 274, 275, 276.
parvicirrum 56.
pinguis 49 (in key).
polycnemis 43, 44.
rotalaria 56.
samoana 49 (in key), 57, 271, 273, 275.
samoanum 52.
schlegelii 47.
Comanthus solaster 49 (in key).
trichoptera 49 (in key).
wahlbergii 49 (in key).
Comanthus *(Bennettia) bennetti* 51.
samoana 52.
(Cenolia) bennetti **50**.
samoana **52**.
(Comanthus) bennetti 51.
briareus 44.
nobilis 47.
parvicirra 56.
rotalaria 56.
samoana 52.
schlegelii 47.
valida 53.
(Validia) parvicirra 56.
(Vania) annulata **53**.
parvicirra **54**, 56.
Comaster 18, 34 (in key), **35**.
Comaster belli 35 (in key), 38.
coppingeri 15.
delicata 37 (in key), **42**, 275.
distincta 37 (in key), **41**, 272, 273, 275, 276.
fimbriata 15.
fruticosus 36 (in key), 38, 39, **39**, 40, 275.
gracilis 35 (in key).
horridus 19, footnote.
minimus 35 (in key), **40**, 271, 276.
multibrachiata 35 (in key), **39**, 40, 274, 276.
multifida 35 (in key), 36 (in key).
multiradiata 15.
multiradiatus 50.
novaeguineae 35 (in key), 36, footnote, **37**, 38, 39, 272, 274, 276.
parvus 37 (in key), **41**, 274, 275.
philippinensis 36, footnote.
pulcher 37 (in key), **40**, 275.
schönovi 36 (in key), 38, 40.
sentosa 11.
serrata 37 (in key).
sibogae 36 (in key), **40**, 276.
taviana 37 (in key).
typica 38.
comaster, Thaumatometra 255 (in key), **256**.
COMASTERIDAE **1**, 266.
Comasterinae 1 (in key), 2 (in key), **34**.
comata, *Antedon* 61.
Zygometra 59 (in key), **61**, 273, 274, 276.
Comatella 3 (in key), **4**.
Comatella decora 4 (in key).
maculata 4 (in key), **7**, 272, 274.
nigra 4 (in key), **5**, 271, 272, 275, 276.
stelligera 4 (in key), **5**, 272, 276.
Comatilia 4 (in key).
Comatonia 4 (in key).

Comatula 24 (in key), 25 (in key), **26**, **27**, 32.
Comatula *adeonae* 126.
bennetti 50.
brevicirra 54, 55.
brevipinna 186.
carinata 88.
cumingii 30.
dibrachiata 87.
dividua 100, footnote, 100.
dubia 77, footnote, 79.
etheridgei 25, 275.
fimbriata 14, 15.
hagenii 221.
helianthus 56.
indica 97.
jacquinoti 85, 89, 90.
laevissima 84, 87.
leucomelas 100, footnote.
mertensi 55.
micraster 27 (in key), 271.
milberti 89, 90.
multiradiata 11, 14, 50.
nigra 5.
novae-guineae 37.
orientalis 56.
parvicirra 54.
pectinata 27 (in key), 271, 272, 273, 275.
Philippinische 5.
polyactinis 100, footnote, 100.
polymorpha 55.
purpurea 27 (in key), 32, 271, 272, 273, 275, 276.
rotalaria 6, **25**, 26, 275.
scita 100, footnote.
simplex 55.
solaris 26 (in key).
solaris var. hamata 26 (in key), 27 (in key).
solaris 26 (in key), 27 (in key).
tenuicirra 27 (in key), 276.
tessellata 91.
timorensis 54, 55.
sp. 39, 242, 243.
Comatula *(Actinometra) borneensis* 15.
(Alecto) articulata 103.
fimbriata 14.
milberti 89.
multiradiata 11, 14, 50.
palmata 100.
parvicirra 54.
(Antedon) milberti var. *dibrachiata* 88.
(Comatula) micraster **27**.
pectinata **30**.
purpurea **27**, 29.
tenuicirra **29**.
(Validia) etheridgei **25**.
Comatula (Validia) rotalaria 6, **25**.
Comatulella 24 (in key).
Comatulides 24 (in key), **32**.
Comatulides australis 32 (in key), **32**, 275.
decameros 32 (in key), 33.
Cominia australis 32.
Comissia 3 (in key), **19**.
Comissia chadwicki 19 (in key).
dumetum 19, footnote.
gracilipes 20 (in key), **22**, 275.
hartmeyeri 20 (in key).
hispida 19 (in key), **20**, 21, 22, 23, 275.
horridus 19 (in key).
ignota 20 (in key).
littoralis 19 (in key), **21**, 273.
lütkeni 19 (in key), **20**, 21, 275, 276.
parvula 20 (in key), **23**, 272, 273, 275, 276.
pectinifer 19 (in key).
peregrina 19 (in key), 21.
spinosissima 20 (in key), **21**, 276.
compressa, *Antedon* 158, 160.
Parametra 158 (in key), **158**, 160, 276.
Thalassometra 160.
Compsometra 197 (in key), **204**, 213.
Compsometra *crispa* 210.
gracilipes 206.
incommoda 205 (in key), **208**.
iris 205 (in key), **208**, 273.
lacertosa 208.
longicirra 204 (in key), **206**, 271, 273.
lovéni 205 (in key), 208, **209**.
parviflora 205 (in key), **207**, 271, 272, 273, 274, 275.
serrata 205 (in key), 209, **209**.
? *Compsometra* sp. 210.
compta, Heterometra 79 (in key).
conaminis, Neometra 133 (in key).
concinna, Crinometra 187.
Eumorphometra 232 (in key), **232**.
Oligometra 129, footnote.
congesta, Psathyrometra 224 (in key), 228, **228**.
conifer, Atelecrinus 266 (in key), 270.
conifera, *Antedon* 154.
Cosmiometra 154 (in key), **154**.
conjungens, Antedon 100, footnote, 100.
coppingeri, Actinometra 15.
Comaster 15.
coronata, Antedon brevipinna var. 187.
Stephanometra 93, footnote, 94.
Cosmiometra 148 (in key) **153**.
Cosmiometra aster 154 (in key), **155**.
conifera 154 (in key), **154**.
crassicirra 154 (in key), **154**.
delicata 153 (in key), **154**.
gardineri 154 (in key), **154**.

Cosmiometra *helene* 155.
koehleri 154 (in key), **154**.
philippinensis 153 (in key), **155**, 272, 274.
woodmasoni 154 (in key), **155**.
Cotylometra 111 (in key), 112 (in key), **128**.
Cotylometra gracilicirra 70, 128 (in key), **128**, 275, 276.
gracilicirra ornata 70.
ornata 128 (in key).
Craspedometra 72 (in key).
Craspedometra aliena 77, footnote, 80.
amboinae 78, footnote.
anceps 80, 81.
aruensis 80.
crassa, *Pachylometra* 181.
Perissometra 177 (in key), **181**, 275.
crassicirra, *Comanthus* 51.
Cosmiometra 154 (in key). 154.
Thalassometra 154.
crassipinna, *Antedon* 74.
Himerometra 74.
crenulata, *Amphimetra* 80.
Antedon 79.
Heterometra 77 (in key), **79**, 81, 275.
Crinometra 171 (in key), 185, **186**.
Crinometra concinna 187.
gemmata 187.
insculpta 187.
margaritacea 187.
pulchra 187.
crispa, Compsometra 210.
cristata, *Actinometra* 4, footnote.
Asterometra 141 (in key), 142.
Stenometra 157 (in key), **157**.
Crossometra 173 (in key), **174**.
Crossometra helius 174 (in key), **175**, 274.
investigatoris 174 (in key), **175**, 275.
septentrionalis 175 (in key), **176**.
Crotalometra 148 (in key), **148**.
Crotalometra *annandalei* 153.
eupedata 153, 164.
flava 148 (in key), **149**.
infelix 149.
magnicirra 149 (in key), **150**.
marginalis 149 (in key), **150**, 274.
porrecta 148 (in key), **149**.
propinqua 165.
rustica 149 (in key), **149**, 150.
sentifera 149 (in key), **149**.
sulcata 164.
vera 165.
cubensis, *Antedon* 220, 247.
Atelecrinus 247, 267, footnote.
Trichometra 247 (in key), **247**.
cumingi, Actinometra 55.
cumingii, Actinometra 55.
Comatula 30.
Cyclometra 240 (in key), **244**.
Cyclometra clio 244 (in key), **244**.
flavescens 244 (in key), **244**.
Cyllometra 111 (in key), **114**, 116.
Cyllometra albopurpurea 115 (in key), 115, 116.
disciformis 114 (in key), **116**.
gracilis 114 (in key), **115**, 116, 271.
manca 115 (in key), **116**, 116, 276.
soluta 115 (in key).
cypris, Thaumatometra 255 (in key), **256**.

Daidalometra 146 (in key), 147 (in key), **157**.
Daidalometra arachnoides 157 (in key), **157**, 273, 275.
hana 157 (in key), **157**.
decameros, Comatulides 32, (in key), 33.
Decametra 90, 112 (in key), **117**.
Decametra alaudae 117 (in key).
arabica 117 (in key).
brevicirra 118 (in key).
informis 118 (in key), **123**.
laevipinna 118 (in key), **120**, 274.
minima 118 (in key), 121, **121**, 272, 273, 275.
modica 118 (in key).
möbiusi 118, footnote.
mollis 117 (in key), 120.
mylitta 117 (in key), **118**, 272.
parva 118 (in key), **121**, 275, 276.
studeri 118 (in key).
taprobanes 117 (in key).
tigrina 117 (in key).
decipiens, Antedon 77, footnote, 79.
decora, Antedon brevipinna var. 187.
Comatella 4 (in key).
defecta, *Antedon* 236.
Hypalometra **236**.
delicata, Comaster 37 (in key), **42**, 275.
Cosmiometra 153 (in key), **154**.
Heterometra 60, footnote, 62, 63.
Phanogenia 42.
Thalassometra 154.
Trichometra 247 (in key), **248**.
Trichometra 252.
delicatissima, Mariametra 108 (in key).
Democrinus weberi 272, 273, 274, 275.
dentata, Alecto 246.
denticulata, *Amphimetra* 91.
Antedon 91.
Homalometra **91**, 273.
Nanometra 91.
diadema, *Antedon* 157.
Antedon brevipinna var. 187.

diadema, Colobometra 123 (in key).
Stenometra 156 (in key), 157.
diana, *Calometra* 133.
Neometra 132 (in key), **133**, 275.
dibrachiata, *Comatula* 87.
Comatula milberti var. 88.
Dichrometra 98 (in key), 104.
Dichrometra afra 105 (in key).
articulata 103.
bimaculata 104 (in key).
ciliata 105 (in key).
döderleini 104 (in key).
flagellata 104 (in key), **106**, 271, 273, 274.
gotoi 105 (in key).
heliaster 101.
laevicirra 101.
occulta 101.
palmata 101.
protectus 75, 101.
reginae 103.
similis 101.
subtilis 101.
tenera 101.
tenuicirra 104 (in key), **105**, 276.
difficilis, *Actinometra* 7, 8, 9.
Palaeocomatella **8**, 273.
diomedeae, *Antedon* 234.
Pentametrocrinus 261 (in key), **261**, 270, 272.
Perometra 134, 234 (in key), **234**.
dione, Fariometra 249 (in key), **250**, 272.
disciformis, Cyllometra 114 (in key), **116**.
discoidea, Amphimetra 83 (in key), 85, **87**, 88, 89, 90, 272, 275.
Calometra 133.
Himerometra 87.
discolor, Colobometra 123 (in key), **124**, 272, 276.
dissimilis, *Actinometra* 46.
distincta, *Actinometra* 41.
Antedon 185.
Charitometra 176.
Comaster 37 (in key), **41**, 272, 273, 275, 276.
Pachylometra 184 (in key), 185.
divaricata, *Actinometra* 43, footnote, 44.
Comanthus 44.
dividua, *Comatula* 100, footnote, 100.
döderleini, Dichrometra 104 (in key).
Dorometra 199 (in key), **214**.
Dorometra aegyptica 215 (in key), **217**.
briseis 215 (in key), **216**.
clymene 215 (in key), **217**, 273.
gracilis 215 (in key), **215**, 274.
mauritiana 215 (in key), **216**.
nana 58, 215 (in key), **216**, 273, 274.
Dorometra parvicirra 215 (in key), **216**, 272.
dorsata, *Stenometra* 157.
dubia, *Antedon* 77, footnote, 79.
Comatula 77, footnote, 79.
dübenii, Antedon 204 (in key).
dumetum, *Comissia* 19, footnote.
duplex, *Actinometra* 46.
Antedon 154, 160.
Comanthus 47.
Horaeometra **160**.

echinata, *Antedon* 171.
Thalassometra 166 (in key), **171**.
echinus, *Himerometra* 94.
Stephanometra 93 (in key), 94, 271, 272.
electrae, Oligometra 129 (in key).
elegans, *Antedon* 61
Antedon brevipinna var. 187.
Zygometra 59 (in key).
elongata, *Actinometra* 55, 56.
Alecto 104, footnote, 106.
Antedon 106.
Balanometra 232 (in key), **232**.
Perometra 232.
encrinus, Tropiometra 131 (in key).
Endoxocrinus sibogae 275.
ensifer, Amphimetra 83 (in key), **88**.
Himerometra 88.
ensiformis, *Amphimetra* 88.
Epimetra 112 (in key).
erinacea, Oligometra 129 (in key).
Oxymetra 99 (in key).
erythrizon, *Antedon* 226.
Psathyrometra 224 (in key), **226**.
Erythrometra 234 (in key), **235**.
Erythrometra australis 235 (in key), **235**.
ruber 235 (in key), **236**.
eschrichti, *Antedon* 240.
eschrichti var. *magellanica*, *Antedon* 242.
etheridgei, Comatula 275.
Comatula (Validia) **25**.
Euantedon 197 (in key), **200**.
Euantedon moluccana 200 (in key), **201**, 273.
sinensis 200 (in key), **203**.
tahitiensis 199, 200 (in key), **200**.
Eudiocrinus **64**, 266.
Eudiocrinus gracilis 65 (in key).
granulatus 65, footnote, 71.
indivisus 65 (in key), 70, **71**, 272, 273, 274, 276.
japonicus 261.
junceus 64 (in key), **65**, 273.
minor 65, footnote, 70.
ornatus 65 (in key), **70**, 275.
pinnatus 64 (in key), **67**, 276.

Eudiocrinus *semperi* 262.
serripinna 65 (in key), **71**, 271, 276.
varians 262.
variegatus 64 (in key), 68.
venustulus 65 (in key), **68**, 275.
Eumetra 198 (in key), **213**.
Eumetra aphrodite 213 (in key), **213**, 271, 275.
chamberlaini 213 (in key), **213**, 214.
indica 210.
Eumorphometra 223 (in key), **232**.
Eumorphometra concinna 232 (in key), **232**.
hirsuta 232 (in key), **232**.
eupedata, Aglaometra 163 (in key), **164**.
Crotalometra 153, 164.
eversa, Antedon 161.
exigua, Antedon 246.
explicata, Fariometra 249 (in key), **250**.
Trichometra 250.
exquisita, Iridometra 212 (in key), **213**.

Fariometra 245 (in key), **248**.
Fariometra dione 249 (in key), **250**, 272.
explicata 249 (in key), **250**.
scutifera 248 (in key), **249**, 273.
fimbriata, Actinometra 15.
Comaster 15.
Comatula 14, 15.
Comatula (Alecto) 14.
fimbriatus, Antedon 15.
finschii, Oxymetra 99 (in key), 99.
fisheri, Parametra 158 (in key), 158.
Thalassometra 158.
flagellata, *Alecto* 106.
Antedon 106.
Dichrometra 104 (in key), **106**, 271, 273, 274.
flagellifera, Mastigometra 198 (in key), **198**.
flava, *Antedon* 149.
Antedon (Crotalometra) 149.
Crotalometra 148 (in key), 149.
flavescens, Cyclometra 244 (in key), **244**.
flavomaculata, Antedon 93, footnote, 96.
flavopurpurea, Pectinometra 93, 137, 138 (in key).
flexilis, *Antedon* 182.
Pachylometra 182.
Perissometra 178 (in key), **182**.
flora, Heterometra 77 (in key).
Florometra 240 (in key), **240**, 243.
Florometra asperrima 241 (in key), **243**, 244.
laodice 241 (in key), **243**, 244.
magellanica 242 (in key), **242**, 243.
mariae 241 (in key), 242 (in key), **243**, 244.
perplexa 241 (in key), **243**, 244.
serratissima 242 (in key), **243**, 244.
Florometra tanneri 241 (in key), **243**, 244.
fluctuans, Antedon 59, footnote.
Zygometra 61.
formosa, Amphimetra 87.
fragilis, *Antedon* 226.
Monachometra **185**, 273.
Pachylometra 185.
Psathyrometra 223 (in key), **226**.
fruticosus, Comaster 36 (in key), 38, **39**, 40, 275.
fusca, Actinometra 7.

gardineri, Cosmiometra 154 (in key), **154**.
garrettiana, *Antedon* 190.
Chlorometra 190.
gemmata, Crinometra 187.
Gephyrocrinus 264, 268.
gigantea, Oceanometra 150 (in key), **151**, 152, 153
Thalassometra 151.
glacialis, Heliometra 227, 240.
Glyptometra 173 (in key), **190**.
Glyptometra *timorensis* 182.
tuberosa **190**, 194.
gorgonia, Neometra 132 (in key).
Perissometra 177 (in key), **179**, 274, 275
gotoi, Dichrometra 105 (in key).
gracilicirra, Capillaster 10 (in key), **11**, 276.
Cotylometra 70, 128 (in key), **128**, 275, 276
Oligometra 128.
ornata, Cotylometra 70.
gracilipes, Comissia 20 (in key), **22**, 275.
Compsometra 206.
Himerometra 99, footnote.
gracilis, *Actinometra* 15.
Antedon 170.
Antedon brevipinna var. 187.
Comaster 35 (in key).
Cyllometra 114 (in key), **115**, 116, 271.
Dorometra 215 (in key), **215**, 274.
Eudiocrinus 65 (in key).
gracillima, *Iridometra* 215.
Psathyrometra 225 (in key), 226 (in key), **228**.
grandicalyx, *Actinometra* 51.
Comantheria 43 (in key).
grandis, Liparometra 103 (in key).
granulata, Parametra 158 (in key), **160**, 273.
granulatus, Eudiocrinus 65, footnote, 71.
granulifera, Antedon 187.
granulosa, Antedon brevipinna var. 187.
gravieri, Heterometra 78 (in key).
guttata, *Actinometra* 55.
Coccometra 218 (in key), **219**.
gyges, Lamprometra 100 (in key).

hagenii, *Antedon* 220, 221.

hagenii, Coccometra 219 (in key), **221**.
Comatula 221.
hamata, Comatula solaris var. 26 (in key), 27 (in key).
hana, *Antedon* 157.
Daidalometra 157 (in key), **157**.
hartlaubi, Catoptometra 63 (in key).
hartmeyeri, Comissia 20 (in key).
Hathrometra 245 (in key), **246**, 251.
Hathrometra norvegica 246.
hawaiiensis, *Antedon* 170.
Thalassometra 168 (in key), **170**.
helene, Cosmiometra 155.
helgae, Atelecrinus 267 (in key).
helianthoides, Petasometra 113 (in key).
helianthus, Comatula 56.
Himerometra 101.
heliaster, Dichrometra 101.
Himerometra 100, footnote, 101.
Heliometra 240 (in key), **240**.
Heliometra glacialis 227, 240.
magellanica 243.
rhomboidea 243.
Heliometrinae 196 (in key), **239**.
helius, Crossometra 174 (in key), **175**, 274.
Pachylometra 175.
hepburniana, *Antedon* 194.
Strotometra 192 (in key), **194**.
Heterometra 72 (in key), **75**.
Heterometra affinis 79 (in key), **82**, 272.
africana 77 (in key).
amboinae 78 (in key), 78, footnote.
aspera 79 (in key).
ater 78 (in key).
bengalensis 79 (in key).
bengalensis 61, 63.
compta 79 (in key).
crenulata 77 (in key), **79**, 81, 275.
delicata 60, footnote, 62, 63.
flora 77 (in key).
gravieri 78 (in key).
joubini 78 (in key).
madagascarensis 78 (in key).
martensi 75.
nematodon 76 (in key).
philiberti 77 (in key).
producta 76 (in key), 81.
propinqua 76 (in key), **80**, 276.
pulchra 78 (in key).
quinduplicava 76 (in key), **81**, 87, 272.
reynaudii 79 (in key).
savignii 76 (in key).
schlegelii 77 (in key).
singularis 78 (in key).
variipinna 76 (in key).
hibernica, Orthometra **258**.
hibernica, *Trichometra* 247, 258.
Himerometra 72 (in key), **73**.
Himerometra *acuta* 93, footnote, 96.
anceps 79, 87.
bartschi 73 (in key), **75**, 272.
crassipinna 74.
discoidea 87.
echinus 94.
ensifer 88.
gracilipes 99, footnote.
helianthus 101.
heliaster 100, footnote, 101.
kraepelini 74, footnote.
magnipinna 59, 74 (in key), **74**, 274.
martensi 74 (in key).
milberti 83, 84, 85, 87, 89.
molleri 84.
monacantha 96.
persica 73 (in key), 75.
protectus 101.
quinduplicava 81.
robustipinna 74 (in key), 74.
schlegelii 88.
sol 73 (in key).
tessellata 91.
variipinna 79.
HIMEROMETRIDAE **72**.
hirsuta, *Antedon* 232.
Eumorphometra 232 (in key), **232**.
Thalassometra 168 (in key), 169, **169**, 272, 275.
Thaumatometra 232.
hispida, Comissia 19 (in key), **20**, 21, 22, 23, 275.
Homalometra 72, 73 (in key), **91**.
Homalometra denticulata **91**, 273.
hondoensis, Antedon 243.
Horaeometra 145 (in key), **160**.
Horaeometra duplex **160**.
horridus, *Comaster* 19, footnote.
Comissia 19 (in key).
hupferi, Antedon 203 (in key).
Hybometra 198 (in key), **217**.
Hybometra senta **217**.
Hypalocrinus naresianus 273.
Hypalometra 233 (in key), **236**.
Hypalometra defecta **236**.
Hyponome sarsii 59, footnote, 60.
hystrix, Antedon 246.

ignota, Comissia 20 (in key).
imbricata, Charitometra 187.
Comantheria 43 (in key).
Oligometra 129 (in key).
imparipinna, Antedon 100, footnote, 100, 101.
imperialis, Actinometra 26, footnote.

inaequalis, *Antedon* 184.
Pachylometra 184, (in key), **185**.
incerta, Aglaometra 163 (in key), **165**.
Antedon 165.
incisa, Charitometra 191 (in key).
incommoda, *Antedon* 208.
Compsometra 205 (in key), **208**.
indica, Andrometra 210 (in key), **210**.
Antedon 100.
Comatula 97.
Eumetra 210.
Stephanometra 94 (in key), 96, **97**, 276.
Tropiometra 131 (in key).
indivisus, Eudiocrinus 65 (in key), 70, **71**, 272, 273, 275, 276.
Ophiocrinus 71.
inexpectata, Antedon 243.
infelix, Crotalometra 149.
Thalassometra 149.
informis, *Antedon* 123.
Decametra 118 (in key), **123**.
insculpta, Crinometra 187.
insignis, Antedon 123, footnote, 124.
intermedia, *Actinometra* 26, footnote.
Comantheria 43 (in key), 46.
Oligometra 125, footnote.
Prometra 125 (in key).
intricata, Actinometra 53, 55.
Comanthus 53.
inusitata, Psathyrometra 225 (in key), **229**, 231, 271, 274, 276.
invenusta, *Pachylometra* 181.
Perissometra 178 (in key), **181**.
investigatoris, Crossometra 174 (in key), **175**, 275.
Pachylometra 175.
io, Nepiometra 251 (in key), **252**, 274.
Iridometra 198 (in key), **212**.
Iridometra adrestine 212 (in key), **212**.
aegyptica 217.
exquisita 212 (in key), **213**.
gracilis 215.
mauritiana 216.
melpomene 212 (in key), **212**.
nana 216.
parvicirra 216.
psyche 210.
scita 216.
(Eumetra) aphrodite 213.
iris, Compsometra 205 (in key), **208**, 273.
irregularis, Antedon 30, 77, footnote, 79.
isis, *Antedon* 248.
Thaumatometra 248.
Trichometra 247 (in key), **248**.
Isometra 239.
Isometrinae 196 (in key), **239**.
jacquinoti, Amphimetra 83 (in key), 84, **85**, 87, 271, 273.
Antedon 85.
Comatula 85, 89, 90.
japonica, Comanthus 49 (in key), 51.
Oligometra 130 (in key).
japonicus, *Eudiocrinus* 261
Pentametrocrinus 66, 261 (in key), **261**, 270, 271, 272.
joubini, Heterometra 78 (in key).
jukesi, Actinometra 25.
jukesii, Actinometra 25.
junceus, Eudiocrinus 64 (in key), **65**, 273.
jungerseni, Thaumatocrinus 259 (in key).

Kallispongia archeri 209.
kerguelensis, Promachocrinus 26.
klunzingeri, Antedon 100, footnote.
koehleri, Cosmiometra 154 (in key), **154**.
Zygometra 63, footnote.
komachi, Thalassometra 155.
kraepelini, Himerometra 74, footnote.

lacertosa, Compsometra 208.
laevicirra, Antedon 100, footnote, 100.
Dichrometra 101.
laevipinna, Amphimetra 83 (in key), **88**, 90.
Antedon 88.
Decametra 118 (in key), **120**, 274.
Prometra 120.
laevis, *Antedon* 252.
Antedon brevipinna var. 187.
Nepiometra 251 (in key), **252**.
laevissima, Amphimetra 84, 87.
Antedon 84, 87.
Comatula 84, 85, 87.
Lamprometra 98 (in key), **100**.
Lamprometra *brachypecha* 100, footnote, 101.
callipecha, 100, footnote, 101.
gyges 100 (in key).
palmata 100 (in key).
protectus 100 (in key), **100**, 109, 272, 273, 274, 275.
laodice, *Antedon* 243.
Florometra 241 (in key), **243**, 243.
lata, *Antedon* 182.
Charitometra 182.
Perissometra 177 (in key), **182**.
lateralis, Calyptometra 189, 195.
Charitometra 189.
latipinna, *Antedon* 170.
Thalassometra 167 (in key), **170**.
lepida, *Antedon* 100, footnote, 100.
Asterometra 140 (in key), 142.
Leptometra 222 (in key), **231**.

Leptometra celtica 80, 231 (in key).
phalangium 231 (in key).
Leptonemaster 3 (in key).
leucomelas, Comatula 101, footnote.
levigata, Pachylometra 184 (in key), **185**.
Liparometra 98 (in key), **103**.
Liparometra articulata 103 (in key), **103**, 271.
grandis 103 (in key).
regalis 103 (in key), 104.
Lissometra 147 (in key), **160**.
Lissometra alboflava **160**.
litoralis, Actinometra 53.
littoralis, *Actinometra* 53.
Comissia 19 (in key), **21**, 273.
longicirra, *Antedon* 141, 142.
Asterometra 141 (in key), **142**, 275.
Compsometra 204 (in key), **206**, 271, 293.
Ptilometra 142.
longipinna, *Antedon* 253.
Phrixometra **253**.
Prometra 125 (in key), **125**.
lovéni, *Antedon* 123, footnote, 124, 209, 210.
Compsometra 205 (in key), 208, **209**.
lütkeni, Comissia 19 (in key), **20**, 21, 275, 276.
luna, Pachylometra 175.
lusitanica, *Antedon* 171.
Antedon (Crotalometra) 171.
Thalassometra 167 (in key), **171**.
luteofuscum, Comanthus 56.

macilenta, *Pachylometra* 181.
Perissometra 178 (in key), **181**.
macrobrachius, *Actinometra* 10.
Capillaster 9 (in key), **10**, 272.
macrodiscus, Tropiometra 131 (in key).
MACROPHREATA 196, 230.
macropoda, Asterometra 141 (in key).
maculata, *Actinometra* 6, 7, 97.
Comatella 4 (in key), **7**, 272, 274.
madagascarensis, Heterometra 78 (in key).
magellanica, *Antedon* 242.
Florometra 242, (in key), **242**, 244.
Heliometra 243.
Promachocrinus (Florometra) 243.
Solanometra 243.
magna, Oceanometra 151 (in key), **151**, 274.
Thalassometra 151.
magnicirra, *Antedon* 150.
Crotalometra 149 (in key), **150**.
magnicirrus, Antedon 150.
magnicrinus, Antedon 150.
magnifica, *Calometra* 138 (in key), **138**.
Catoptometra 63 (in key), 64.
Comantheria 43 (in key).
Pectinometra 138 (in key), **138**, 272.
magnipeda, Pterometra 143 (in key).
magnipinna, Himerometra 59, 74 (in key), **74**, 274.
major, Psathyrometra 224 (in key), **226**, 231, 271.
manca, *Antedon* 116.
Cyllometra 115 (in key), **116**, 116, 276.
margaritacea, Crinometra 187.
margaritifera, *Mariametra* 108, footnote, 108.
Thalassometra 169 (in key), **169**, 271.
marginalis, Crotalometra 149 (in key), **150**, 274.
Thalassometra 150.
marginata, *Antedon* 94, footnote, 95.
Oligometra 126, 127.
Stephanometra 95.
Thalassometra 167 (in key), **170**.
mariae, *Antedon* 243.
Capillaster 10 (in key).
Florometra 241 (in key), 242 (in key), **243**, 244.
Oreometra 136.
Mariametra 62, 98 (in key), **107**.
Mariametra delicatissima 108 (in key).
margaritifera 108, footnote, 108.
subcarinata 108 (in key).
tenuipes 108 (in key), **110**, 275.
tuberculata 108, (in key), **108**, 271.
vicaria 108 (in key), **108**, 271.
MARIAMETRIDAE **97**.
martensi, *Heterometra* 75.
Himerometra 74 (in key).
Mastigometra 197 (in key), **198**.
Mastigometra flagellifera 198 (in key), **198**.
micropoda 198 (in key), **200**.
pacifica 198 (in key), **199**.
mauritiana, Dorometra 215 (in key), **216**.
Iridometra 216.
mediterranea, Antedon 202, 203 (in key).
melpomene, Iridometra 212 (in key), **212**.
mertensi, Antedon 55.
Comatula 55.
mertoni, Zygometra 59, footnote, 60.
Metacrinus acutus 274.
cingulatus 274, 275.
nobilis 274.
nobilis var. timorensis 275.
serratus 272.
suluensis 272.
superbus 274.
varians 271, 272, 274.
meyeri, Actinometra 53.
micraster, Comatula 27 (in key), 271.
Comatula (Comatula) **27**.
Microcomatula 4 (in key).
microdiscus, *Antedon* 60.
Zygometra 59 (in key), **60**, 275, 277, 278.
micropoda, Mastigometra 198 (in key), **200**.

milberti, Amphimetra 83, 84, 85, 86, 88, **89**, 90.
Antedon 84, 85, 87, 89, 130.
Antedon (Comatula) 89.
Comatula 89, 90.
Comatula (Alecto) 89.
Himerometra 83, 84, 85, 87, 89.
var. *dibrachiata, Comatula* 88.
minckerti, Nanometra 239.
minima, Decametra 118 (in key), 121, **121**, 272, 273, 275.
Phanogenia 38.
Prometra 121.
Psathyrometra 226 (in key), **228**, 271, 273.
minimus, Comaster 35 (in key), **39**, 271, 276.
Monachocrinus 272.
minor, Antedon 239.
Eudiocrinus 65, footnote, 70.
minuta, Antedon 212.
minutissima, *Bathymetra* 248.
Trichometra 247 (in key), **248**.
mira, Psathyrometra 225 (in key), 226, **227**, 271, 273.
mirifica, Asterometra 141 (in key), **141**, 142, 275.
modica, Decametra 118 (in key).
möbiusi, Decametra 118, footnote.
molleri, Amphimetra 82 (in key), 83, **84**, 86, 90.
Himerometra 84.
mollis, Decametra 117 (in key), 120.
moluccana, *Antedon* 201.
Euantedon 200 (in key), **201**, 273.
monacantha, *Antedon* 96, 97.
Himerometra 96.
Stephanometra 75, 93 (in key), 94, **96**, 97, 272, 274.
Monachocrinus minimus 272.
poculum 274.
Monachometra 173 (in key), **185**.
Monachometra fragilis **185**, 273.
moroccana, Antedon 204 (in key).
mortenseni, Amphimetra 77, footnote.
multibrachiata, *Actinometra* 39.
Comaster 35 (in key), **39**, 40, 274, 276.
Phanogenia 39.
multicolor, Neometra 133 (in key), 134, 136.
multifida, *Actinometra* 38, 46.
Comaster 35 (in key), 36 (in key).
multiradiata, *Actinometra* 7, 15, 50.
Antedon 59, footnote, 60.
Asterias 14.
Capillaster 10 (in key), 13, **14**, 18, 271, 272, 273, 274, 275.
Comaster 15.
Comatula 11, 50.
Comatula (Alecto) 11, 14, 50.
Zygometra 60.
multiradiatus, Comaster 50.
multispina, *Antedon* 171.
multispina, Thalassometra 166 (in key), **171**.
mutabilis, Actinometra 55.
mylitta, Decametra 117 (in key), **118**, 272.

nana, *Antedon* 216.
Dorometra 58, 215 (in key), **216**, 273, 274.
Iridometra 216.
Nanometra 234 (in key), **236**.
Nanometra bowersi 237 (in key), **239**.
clymene 237 (in key), **237**, 274.
denticulata 91.
minckerti 239.
naresi, *Promachocrinus* 260.
Thaumatocrinus 260 (in key), 260, 273.
naresianus, Hypalocrinus 273.
Nemaster 2 (in key), 18.
nematodon, Heterometra 76 (in key).
Neocomatella 3 (in key), 9.
Neocomatella alata 9.
Neometra 132.
Neometra acanthaster 132 (in key).
alecto 133 (in key), **137**, 276.
conaminis 133 (in key).
diana 132 (in key), **133**, 275.
gorgonia 132 (in key).
multicolor 133 (in key), 134, 136.
sibogae 132 (in key), **135**, 276.
spinosissima 133 (in key).
Nepiometra 245 (in key), **251**.
Nepiometra alcyon 251 (in key), **251**, 274.
io 251 (in key), **252**, 274.
laevis 251 (in key), **252**.
obscura 251 (in key), **251**.
parvula 251 (in key), **253**.
nigra, *Actinometra* 5.
Comatella 4 (in key), **5**, 271, 272, 275, 276.
Comatula 5.
nigrolineata, Coccometra 219 (in key), **220**, 247.
nobilis, *Actinometra* 46, 47.
Comanthus 47.
Comanthus (Comanthus) 47.
Metacrinus 274.
var. timorensis, Metacrinus 275.
nodipes, Bythocrinus 272, 274.
norvegica, Hathrometra 246.
notata, Actinometra 5.
novae-guineae, Actinometra 38, 39.
Alecto 37.
novaeguineae, Comaster 35 (in key), 36, footnote, **37**, 38, 39, 272, 274, 276.
Comatula 37.
Phanogenia 38, 39.

obscura, Nepiometra 251 (in key), **251**.
Trichometra 251.

occidentalis, Oligometra 129 (in key), 131.
Oligometra serripinna var. 130.
occulta, Antedon 100, footnote, 100.
Dichrometra 101.
Oceanometra 146 (in key), **150**.
Oceanometra annandalei 151 (in key), 153, **153**.
gigantea 150 (in key), **151**, 152, 153.
magna 151 (in key), **151**, 274.
okelli, Antedon 100, footnote, 101.
Oligometra 111 (in key), 113 (in key), **128**.
Oligometra *adeonae* 126.
anisa 126.
bidens 126.
caledoniae 130 (in key), 130.
carpenteri 129 (in key), **130**, 275.
chinensis 130 (in key).
concinna 129, footnote.
electrae 129 (in key).
erinacea 129 (in key).
gracilicirra 128.
imbricata 129 (in key).
intermedia 125, footnote.
japonica 130 (in key).
marginata 126, 127.
occidentalis 129 (in key), 131.
pinniformis 89.
pulchella 129, footnote, 130.
serripinna 129 (in key), **130**, 236, 273, 275.
var. *occidentalis* 130.
thetidis 111, footnote.
Oligometrides 111 (in key), **126**.
Oligometrides adeonae 46, 126, 275, 276.
OLIGOPHREATA 1.
omissa, *Antedon* 171.
Thalassometra 166 (in key), **171**.
Ophiocrinus indivisus 71.
ophiura, Catoptometra 63 (in key). **64**, 271, 275.
Oreometra mariae 136.
orientalis, Antedon 239.
Comatula 56.
orion, *Antedon* 160.
Parametra 158 (in key), **160**.
Thalassometra 160.
ornata, Antedon brevipinna var. 187.
Cotylometra 128 (in key).
Cotylometra gracilicirra 70.
ornatissima, Strotometra 191 (in key), 192, 273.
ornatus, Eudiocrinus 65 (in key), **70**, 275.
Orthometra 244 (in key), **258**.
Orthometra hibernica **258**.
owstoni, Prometra 125 (in key), 125.
oxyacantha, *Antedon* 94.
Stephanometra 94 (in key), **94**, 272, 276.
Oxymetra 97 (in key), 98.
Oxymetra aranea 99 (in key).
Oxymetra erinacea 99 (in key).
finschii 99 (in key), 99.
tenuicirra 98 (in key), **99**, 276.

Pachylometra 173 (in key), **184**.
Pachylometra *angusticalyx* 178.
crassa 181.
distincta 184 (in key), **185**.
flexilis 182.
fragilis 185.
helius 175.
inaequalis 184 (in key), **184**.
invenusta 181.
investigatoris 175.
levigata 184 (in key), **185**.
luna 175.
macilenta 181.
patula 179.
robusta 179.
sclateri 184 (in key), **185**.
selene 179.
septentrionalis 176.
smithi 185.
pacifica, Mastigometra 198 (in key), **199**.
Palaeocomatella 3 (in key), **7**.
Palaeocomatella difficilis **8**, 273.
palmata, *Antedon* 97, 101.
Comatula (Alecto) 100.
Dichrometra 101.
Lamprometra 100 (in key).
papuensis, Amphimetra 83 (in key), 87, **89**.
Parametra 146 (in key), 147 (in key), 148 (in key), **158**.
Parametra compressa 158 (in key), **158**, 160, 276.
fisheri 158 (in key), **158**.
granulata 158 (in key), **160**, 273.
orion 158 (in key), **160**.
parilis, Amphimetra 82 (in key), **84**.
parva, Decametra 118 (in key), **121**, 275, 276.
Prometra 121.
Psathyrometra 225 (in key), **228**.
Thaumatometra 256 (in key), **257**.
parvicirra, *Actinometra* 30, 41, 44, 46, 52, 53, 55, 56.
Alecto 54.
Antedon 216.
Comanthus 50 (in key), 56, 271, 272, 273, 274, 275, 276.
Comanthus (Comanthus) 56.
Comanthus (Validia) 56.
Comanthus (Vania) **54**, 56.
Comatula 54.
Comatula (Alecto) 54.
Dorometra 215 (in key), **216**, 272.
Iridometra 216.
parvicirrum, Comanthus 56.
parvicurva, Actinometra 56.

parviflora, Compsometra 205 (in key), **207**, 271, 272, 273, 274, 275.
parvipinna, *Antedon* 194.
Strotometra 192 (in key), **194**, 274, 275.
parvula, *Antedon* 253.
Comissia 20 (in key), **23**, 272, 273, 275, 276.
Nepiometra 251 (in key), **253**.
parvus, Comaster 37 (in key), 41, 274, 275.
patula, *Antedon* 179.
Pachylometra 179.
Perissometra 176 (in key), 179.
paucicirra, *Actinometra* 25.
paupera, Toxometra **210**, 272, 276.
pectinata, *Actinometra* 30.
Asterias 14, 30.
Comatula 27 (in key), 271, 272, 273, 275.
Comatula (Comatula) **30**.
pectinifer, Comissia 19 (in key).
Pectinometra 138.
Pectinometra carduum 138 (in key).
flavopurpurea 93, 137, 138.
magnifica 138 (in key), **138**, 272.
PENTAMETROCRINIDAE 259, 265, 266.
Pentametrocrinus 227, 259 (in key), **260**, 265, 270.
Pentametrocrinus atlanticus 261 (in key).
diomedeae 261 (in key), **261**, 270, 272.
japonicus 66, 261 (in key), **261**, 270, 271, 272.
semperi 261 (in key), **262**, 274.
tuberculatus 261 (in key), 270.
varians 66, 260 (in key), **262**, 270, 271, 276.
peregrina, Comissia 19 (in key), 21.
pergracilis, Thalassometra 167 (in key), **170**.
Perissometra 173 (in key), **176**.
Perissometra angusticalyx 176 (in key) **178**.
crassa 177 (in key), **181**, 275.
flexilis 178 (in key), **182**.
gorgonia 177 (in key), **179**, 274, 275.
invenusta 178 (in key), **181**.
lata 177 (in key), **182**.
macilenta 178 (in key), **181**.
patula 176 (in key), **179**.
robusta 176, 178 (in key), **179**, 181, 275.
selene 177 (in key), **179**.
timorensis 177 (in key), **182**, 275.
perlegens, *Stella chinensis* 14.
Perometra 234 (in key), **234**.
Perometra afra 234 (in key), **234**.
diomedeae 134, 234 (in key), **234**.
elongata 232.
pusilla 234 (in key), **234**.
Perometrinae 196 (in key), **233**, 266.
peronii, *Actinometra* 50, 51.
perplexa, *Antedon* 243.
Florometra 241 (in key), **243**, 244.
Stiremetra 161 (in key), **161**, 274.
Thalassometra 161.
persica, Himerometra 73 (in key), 75.
perspinosa, *Antedon* 124.
Colobometra 123 (in key), **124**, 271, 273, 274.
Petasometra 111 (in key), 112 (in key), **113**.
Petasometra clarae 113 (in key), **113**, 271, 274.
helianthoides 113 (in key).
petasus, Antedon 199, 204 (in key), 211.
phalangium, Leptometra 231 (in key).
Phanogenia delicata 42.
minima 38.
multibrachiata 39.
novae-guineae 38, 39.
typica 35, footnote, 37, 38.
philiberti, Heterometra 77 (in key).
philippinensis, *Comaster* 36, footnote.
Cosmiometra 153 (in key), **155**, 272, 274.
Philippinische Comatula 5.
Phrixometra 246 (in key), **253**.
Phrixometra longipinna **253**.
picta, Tropiometra 131 (in key).
pinguis, Comanthus 49 (in key).
pinnatus, Eudiocrinus 64 (in key), **67**, 276.
pinniformis, Amphimetra 83 (in key), **89**.
Antedon 89, 126.
Oligometra 89.
plana, Thaumatometra 255 (in key), **258**.
Trichometra 258.
poculum, Monachocrinus 274.
Poecilometra 172 (in key), **190**.
Poecilometra acoela 190 (in key), **190**, 273.
scalaris 190 (in key).
polyactinis, *Comatula* 100, footnote, 100.
polycnemis, Comantheria 43 (in key), **43**, 272.
Comanthus 43, 44.
polymorpha, *Actinometra* 55.
Comatula 55.
polypus, *Antedon* 98.
Pontiometra 97 (in key), **98**.
Pontiometra andersoni **98**, 276.
porrecta, *Antedon* 149.
Antedon (Crotalometra) 149.
Crotalometra 148 (in key), **149**.
pourtalèsi, Antedon 187.
Atelecrinus 267, footnote.
priamus, Strotometra 191 (in key), **194**, 275.
pristina, Zygometra 60.
producta, Heterometra 76 (in key), 81.
profundorum, *Psathyrometra* 226.
prolixa, Antedon 246.

Promachocrinus 239 (in key), 240.
Promachocrinus *abyssorum* 259, footnote.
kerguelensis 26.
naresi 260.
(Florometra) magellanica 243.
Prometra 112 (in key), 124, **125**.
Prometra chadwicki 125 (in key).
intermedia 125 (in key).
laevipinna 120.
longipinna 125 (in key), **125**.
minima 121.
owstoni 125 (in key), 125.
parva 121.
propinqua, Aglaometra 163 (in key), 164, 165, **165**.
Amphimetra 80.
Crotalometra 165.
Heterometra 76 (in key), **80**, 276.
protecta, Antedon 100.
protectus, *Antedon* 96, 100.
Dichrometra 75, 101.
Himerometra 101.
Lamprometra 100 (in key), **100**, 109, 272, 273, 274, 275.
Psathyrometra 222 (in key), **223**, 238, 263, 265.
Psathyrometra alascana 223 (in key), **226**.
anomala 225 (in key), **230**, 274.
antarctica 225 (in key, **230**.
bigradata 224 (in key), **226**.
borealis 223 (in key), **226**.
congesta 224 (in key), **228**, 228.
erythrizon 224 (in key), **226**.
fragilis 223 (in key), **226**.
gracillima 225 (in key), 226 (in key), **228**.
inusitata 225 (in key), **229**, 231, 271, 274, 276.
major 224 (in key), **226**, 231, 271.
minima 226 (in key), **228**, 271.
mira 225 (in key), 226, **227**, 271, 273.
parva 225 (in key), **228**.
profundorum 226.
sp. **231**, 271.
sp. 226.
psyche, Andrometra 210 (in key), **210**.
Antedon 210.
Iridometra 210.
Pterometra 140 (in key), **143**.
Pterometra magnipeda 143 (in key).
pulcherrima 143 (in key), **145**, 273.
splendida 143 (in key), 144.
trichopoda 143 (in key), 144.
venusta 143 (in key), **143**, 273.
Ptilocrinus 264.
Ptilometra 140 (in key).
Ptilometra longicirra 142.
Ptilometrinae 139 (in key), **140**.
pubescens, *Antedon* 170.
Thalassometra 168 (in key), **170**.
pulchella, Actinometra 8.
Oligometra 129, footnote, 130.
pulcher, *Antedon* 104, footnote.
Comaster 37 (in key), **40**, 275.
pulcherrima, *Asterometra* 145.
Pterometra 143 (in key), **145**, 273.
pulchra, Antedon brevipinna var. 187.
Crinometra 187.
Heterometra 78 (in key).
pumila, Antedon 123, footnote, 208, 209, 210.
punctata, Zygometra 60 (in key), **61**, 275.
purpurea, *Alecto* 27.
Comatula 27 (in key), 32, 271, 272, 273, 274, 275, 276.
Comatula (Comatula) **27**, 29.
Toxometra 210.
pusilla, *Antedon* 234.
Perometra 234 (in key), 234.
pyramidalis, Zenometra 231.

quadrata, Actinometra 55, 56.
quinduplicava, *Antedon* 81.
Heterometra 76 (in key), **81**, 87, 272.
Himerometra 81.
quinquecostata, *Antedon* 157.
Stenometra 156 (in key), **157**.
Thalassometra 157.

radiospina, Antedon 161.
rathbuni, Antedon 243.
regalis, *Actinometra* 38, 39, 46, 47.
Liparometra 103 (in key), 104.
reginae, Antedon 103.
Dichrometra 103.
remota, *Antedon* 259.
Thaumatometra 259.
Tonrometra 258 (in key), **259**.
renovatus, Thaumatocrinus 259 (in key).
reynaudii, Heterometra 79 (in key).
rhomboidea, Antedon 242, 243.
Heliometra 243.
robusta, *Actinometra* 26, footnote.
Antedon 179.
Chlorometra 189.
Chondrometra 188 (in key), 188, **189**, 275.
Pachylometra 179.
Perissometra 176, 178 (in key), **179**, 181, 275.
robustipinna, *Actinometra* 51.
Himerometra 74 (in key), 74.
rosacea, Antedon 243.
rotalaria, *Actinometra* 55.
Comanthus (Comanthus) 56.

rotalaria, Comatula 6, 25, 26, 275.
Comatula (Validia) 6, **25**.
rotula, Comantheria 43 (in key), **44**, 275.
ruber, *Antedon* 236.
Erythrometra 235 (in key), **236**.
rubroflava, Catoptometra 63 (in key), 64.
rugosa, Chondrometra 187 (in key), **188**, 275, 277, 278.
rugosus, Thaumatocrinus 260 (in key).
rustica, Crotalometra 149 (in key), **149**, 150.
Thalassometra 149.

samoana, Comanthus 49 (in key), 57, 271, 273, 275.
Comanthus (Bennettia) 52.
Comanthus (Cenolia) **52**.
Comanthus (Comanthus) 52.
samoanum, Comanthus 52.
Sarametra 223 (in key), **231**.
Sarametra triserialis **231**.
sarsii, Alecto 246.
Hyponome 59, footnote, 60.
savignii, Heterometra 76 (in key).
scalaris, Poecilometra 190 (in key).
schlegelii, *Actinometra* 46.
Amphimetra 88, 89.
Comanthina 38, **46**, 271, 272, 273, 274, 276.
Comanthus 47.
Comanthus (Comanthus) 47.
Heterometra 77 (in key).
Himerometra 88.
schönovi, Comaster 36 (in key), 38, 40.
scita, Comatula 100, footnote.
Iridometra 216.
sclateri, *Antedon* 185.
Pachylometra 184 (in key), **185**.
scutifera, Fariometra 248 (in key), **249**, 273.
selene, *Pachylometra* 179.
Perissometra 177 (in key), **179**.
Selenemetra tenuicirra 99.
viridis 99.
semperi, *Eudiocrinus* 262.
Pentametrocrinus 261 (in key), **262**, 274.
senta, Hybometra **217**.
sentifera, Crotalometra 149 (in key), **149**.
Thalassometra 149.
sentosa, *Actinometra* 11.
Capillaster 10♂ (in key), **11**, 272, 274, 275.
Comaster 11.
septentrionalis, Crossometra 175 (in key), **176**.
Pachylometra 176.
Thaumatometra 256 (in key), **258**.
serrata, *Antedon* 209.
Comaster 37 (in key).
Compsometra 205 (in key), 209, **209**.
serratissima, *Antedon* 243.
Florometra 242 (in key), **243**, 244.
serratus, Metacrinus 272.
serripinna, *Antedon* 130.
Eudiocrinus 65 (in key), **71**, 271, 276.
Oligometra 129 (in key), **130**, 236, 273, 275.
var. occidentalis, Oligometra 130.
sibogae, Atopocrinus **263**, 274.
Comaster 36 (in key), **40**, 276.
Endoxocrinus 275.
Neometra 132 (in key), **135**, 276.
similis, Antedon 100, footnote, 100, 101.
simplex, Actinometra 7, 55.
Comatula 55.
sinensis, Amphimetra **90**.
Antedon 90.
Euantedon 200 (in key), **203**.
singularis, Heterometra 78 (in key).
smithi, Charitometra 184, footnote, 185.
Pachylometra 185.
sol, Himerometra 73 (in key).
Solanometra 239 (in key), **240**.
Solanometra magellanica 243.
solaris, *Actinometra* 30.
Comatula 26 (in key).
Comatula solaris var. 26 (in key), 27 (in key).
var. hamata, Comatula 26 (in key), 27 (in key).
var. solaris, Comatula 26 (in key), 27 (in key).
solaster, Comanthus 49 (in key).
soluta, Cyllometra 115 (in key).
spectabilis, Amphimetra 82 (in key), **83**.
spicata, *Antedon* 95.
Stephanometra 94 (in key), **95**, 272.
spinicirra, *Antedon* 161.
Stiremetra 160 (in key), **161**.
spinifera, *Antedon* 156.
Stylometra **156**.
spinipinna, *Antedon* 95.
Stephanometra 93 (in key), **95**, 272.
spinosa, Antedon brevipinna var. 187.
spinosissima, Comissia 20 (in key), **21**, 276.
Neometra 133 (in key).
splendida, Pterometra 143 (in key), 144.
Stella chinensis perlegens 14.
stellata, Actinometra 35, footnote, 37.
stelligera, *Actinometra* 5.
Comatella 4 (in key), **5**, 272, 276.
Stenometra 148 (in key), **156**.
Stenometra *acuta* 157.
arachnoides 157.
cristata 157 (in key).
diadema 156 (in key), **157**.
dorsata 157.
quinquecostata 156 (in key), **157**.
Stephanometra 93.
Stephanometra *coronata* 93, footnote, 94.

Stephanometra echinus 93 (in key), **94**, 271, 272.
indica 94 (in key), 96, **97**, 276.
marginata 95.
monacantha 75, 93 (in key), 94, **96**, 97, 272, 274.
oxyacantha 94 (in key), **94**, 272, 276.
spicata 94 (in key), **95**, 272.
spinipinna 93 (in key), **95**, 272.
stypacantha 94, footnote, 95.
tenuipinna 93 (in key).
tuberculata 95.
STEPHANOMETRIDAE 93.
stewarti, *Actinometra* 15.
Stiremetra 146 (in key), **160**.
Stiremetra acutiradia 161 (in key), **161**.
breviradia 161 (in key), **161**.
carinifera 161 (in key), **161**.
perplexa 161 (in key), **161**, 274.
spinicirra 160 (in key), **161**.
strata, *strota*, *Actinometra* 26, footnote.
Strotometra 172 (in key), **191**.
Strotometra hepburniana 192 (in key), **194**.
ornatissima 191 (in key), **192**, 273.
parvipinna 192 (in key), **194**, 274, 275.
priamus 191 (in key), **194**, 275.
studeri, Decametra 118 (in key).
stylifer, *Antedon* 104, footnote.
Stylometra 147 (in key), **156**.
Stylometra spinifera **156**.
stypacantha, *Stephanometra* 94, footnote, 95.
suavis, Colobometra 123 (in key).
subcarinata, Mariametra 108 (in key).
subtilis, *Antedon* 100, footnote, 101.
Dichrometra 101.
sulcata, Aglaometra 163 (in key), **164**, 273.
Crotalometra 164.
sulcatus, Atelecrinus 266, 267 (in key), **267**, 268, 272.
suluensis, Metacrinus 272.
superbus, Metacrinus 274.

tahitiensis, Euantedon 199, 200 (in key), **200**.
tanneri, *Antedon* 243.
Florometra 241 (in key), **243**, 244.
taprobanes, Decametra 117 (in key).
taviana, Comaster 37 (in key).
tenax, *Actinometra* 5.
tenella, Asterias 246.
tenelloides, *Antedon* 218.
Thysanometra 218 (in key), **218**.
tenera, *Antedon* 100, footnote.
Dichrometra 101.
tenuicirra, *Antedon* 218.
Capillaster 10 (in key), 11, **12**, 273, 276.
Comatula 27 (in key), 276.
Comatula (Comatula) **29**.
tenuicirra, Dichrometra 104 (in key), **105**, 276.
Oxymetra 98 (in key), **99**, 276.
Selenemetra 99.
Thysanometra 218 (in key), 218.
tenuipes, Adelometra 233 (in key), **233**.
Mariametra 108 (in key), **110**, 275.
tenuipinna, Stephanometra 93 (in key).
tenuis, *Antedon* 256.
Thaumatometra 252, 254 (in key), **256**.
tessellata, *Alecto* 90, 91.
Amphimetra **90**.
Comatula 91.
Himerometra 91.
tessellatus, *Antedon* 91.
Thalassocrinus 264, 268.
Thalassometra 145 (in key), 147 (in key), **166**.
Thalassometra agassizii 167 (in key), **170**.
annandalei 153.
aster 155.
attenuata 168 (in key), **171**.
bispinosa 166 (in key), **170**.
compressa 160.
crassicirra 154.
delicata 154.
echinata 166 (in key), **171**.
fisheri 158.
gigantea 151.
hawaiiensis 168 (in key), **170**.
hirsuta 168 (in key), 169, **169**, 272, 275.
infelix 149.
komachi 155.
latipinna 167 (in key), **170**.
lusitanica 167 (in key), **171**.
magna 151.
margaritifera 169 (in key), **169**, 271.
marginalis 150.
marginata 167 (in key), **170**.
multispina 166 (in key), **171**.
omissa 166 (in key), **171**.
orion 160.
pergracilis 167 (in key), **170**.
perplexa 161.
pubescens 168 (in key), **170**.
quinquecostata 157.
rustica 149.
sentifera 149.
villosa 167 (in key), **170**.
THALASSOMETRIDAE **139**.
Thalassometrinae 140 (in key), **145**.
Thaumatocrinus 227, 259 (in key), **259**.
Thaumatocrinus borealis 259 (in key), 260.
jungerseni 259 (in key).
naresi 260 (in key), **260**, 273.
renovatus 259 (in key).

Thaumatocrinus rugosus 260 (in key).
Thaumatometra 246 (in key), **254**.
Thaumatometra abyssorum 255 (in key), **256**.
alcyon 251 (in key).
alternata 255 (in key), **256**.
brevicirra 255 (in key), **257**.
comaster 255 (in key), **256**.
cypris 255 (in key), **256**.
hirsuta 232.
isis 248.
parva 256 (in key), **257**.
plana 255 (in key), **258**.
remota 259.
septentrionalis 256 (in key), **258**.
tenuis 252, 254 (in key), **256**.
thysbe 255 (in key), **257**, 271.
thetidis, Oligometra 111, footnote.
Thysanometra 217 (in key), **218**.
Thysanometra tenelloides 218 (in key), **218**.
tenuicirra 218 (in key), 218.
Thysanometrinae 196 (in key), **217**.
thysbe, Thaumatometra 255 (in key), **257**, 271.
tigrina, Decametra 117 (in key).
timorensis, *Alecto* 54.
Comatula 54, 55.
Glyptometra 182.
Metacrinus nobilis var. 275.
Perissometra 177 (in key), **182**, 275.
Tonrometra 244 (in key), **258**.
Tonrometra brevipes 258 (in key), **258**, 273.
remota 258 (in key), **259**.
Toxometra 197 (in key), **210**.
Toxometra paupera **210**, 272, 276.
purpurea 210.
trachygaster, Actinometra 54, 55.
Trichometra 245 (in key), **246**, 251.
Trichometra *aspera* 247.
brevipes 258.
cubensis 247 (in key), **247**.
delicata 247 (in key), **248**.
delicata 252.
explicata 250.
hibernica 247, 258.
isis 247 (in key), **248**.
minutissima 247 (in key), **248**.
obscura 251.
plana 258.
vexator 246 (in key), **247**.
sp. 247.
trichopoda, Pterometra 143 (in key), 144.
trichoptera, Comanthus 49 (in key).
Triscaedecacnemos 14.
triserialis, Saralmetra 231.
Zenometra 231.
Τρισκαιδεκάκνεμος 14.
Tropiometra 126, **131**.
Tropiometra afra 131 (in key), **132**, 273.
audouini 131 (in key).
carinata 131 (in key).
encrinus 131 (in key).
indica 131 (in key).
macrodiscus 131 (in key).
picta 131 (in key).
TROPIOMETRIDAE 131.
tuberculata, *Antedon* 94, footnote, 95.
Mariametra 108 (in key), **108**, 271.
Stephanometra 95.
tuberculatus, Pentametrocrinus 261 (in key), 270.
tuberosa, *Antedon* 190.
Antedon brevipinna var. 187.
Glyptometra **190**, 194.
typica, Actinometra 38, 47.
Comaster 38.
Phanogenia 35, footnote, 37, 38.

valida, *Actinometra* 53.
Aglaometra 163 (in key), **164**, 273.
Antedon 164.
Comanthus (Comanthus) 53.
Validia 24 (in key), **25**.
Vania 34 (in key), 48 (in key).
variabilis, Actinometra 35, footnote, 38, 55.
varians, *Eudiocrinus* 262.
Metacrinus 271, 272, 274.
Pentametrocrinus 66, 260 (in key), **262**, 270, 271, 276.
variegatus, Eudiocrinus 64 (in key), 68.
variipinna, *Amphimetra* 77, footnote, 80.
Antedon 77, footnote, 79, 80.
Heterometra 76 (in key).
Himerometra 79.
? *variispina, Antedon* 108.
venusta, Pterometra 143 (in key), **143**, 273.
venustulus, Eudiocrinus 65 (in key), **68**, 275.
vepretum, Colobometra 123 (in key).
vera, Aglaometra 163 (in key), 164, **165**, 274.
Crotalometra 165.
vexator, Trichometra 246 (in key), **247**.
vicaria, *Antedon* 108.
Mariametra 108 (in key), **108**, 271.
villosa, *Antedon* 170.
Thalassometra 167 (in key), **170**.
viridis, Selenemetra 99.

wahlbergii, Comanthus 49 (in key).
weberi, Comantheria 43 (in key), 45, **46**, 271.
Democrinus 272, 273, 274, 275.
wood-masoni, Antedon 155.
woodmasoni, Cosmiometra 154 (in key), **155**.
wyvillii, Atelecrinus 267 (in key), 268.

xanthum, Comanthus annulatum 53.

Zenometra 196 (in key), **231**, 263, 266.
Zenometra columnaris **231**.
pyramidalis 231.
triserialis 231.
Zenometrinae 196 (in key), **222**, 230, 266.
Zygometra 59.
Zygometra andromeda 59 (in key).
comata 59 (in key), **61**, 273, 274, 276.
Zygometra elegans 59 (in key).
fluctuans 61.
koehleri 63, footnote.
mertoni 59, footnote, 60.
microdiscus 59 (in key), **60**, 275, 277, 278.
multiradiata 60.
pristina 60 (in key).
punctata 60 (in key), **61**, 275.
ZYGOMETRIDAE **59**, 266.

CORRIGENDA.

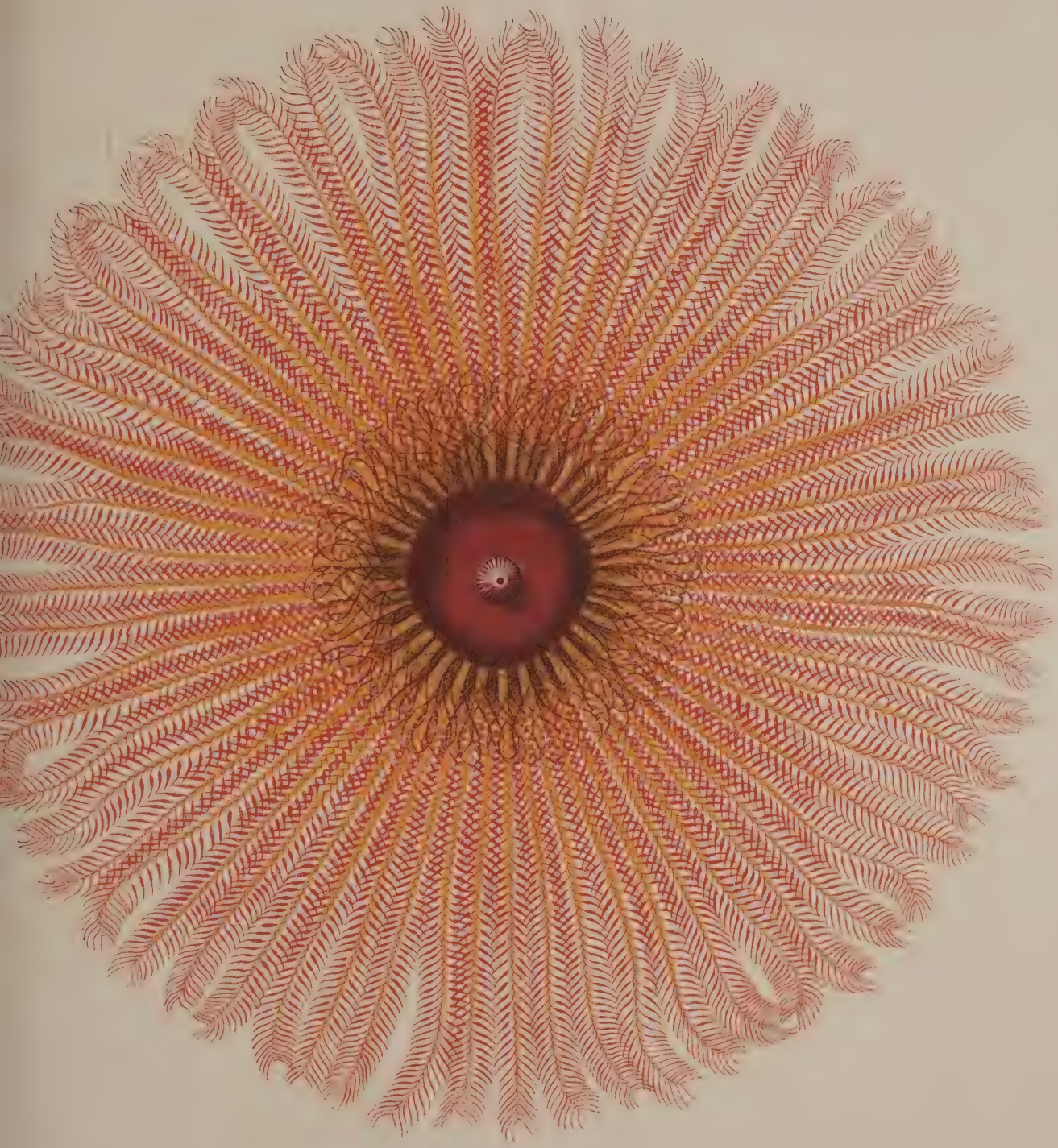
p. 51. In the 7th line from top „grandicalix" must be read „grandicalyx".

p. 191. In the 10th line from top as also in the explanation of textfigures 10 and 11 „ornatissimus" is to be altered in „ornatissima".

EXPLANATION OF PLATES.

PLATE I.

Comatella nigra. Ventral view of a specimen with sixty-five arms from Stat. 99. Natural size.



er del.

Fa. P. W. M. Trap impr.

PLATE II.

Comatella stelligera. Ventral view of a specimen with thirty-seven arms from Stat. 99. Natural size.

Decker del.

Fa. P. W. M. Trap impr.

PLATE III.

Capillaster multiradiata. Ventral view of a specimen with twenty-six arms from Stat. 99. Natural size.

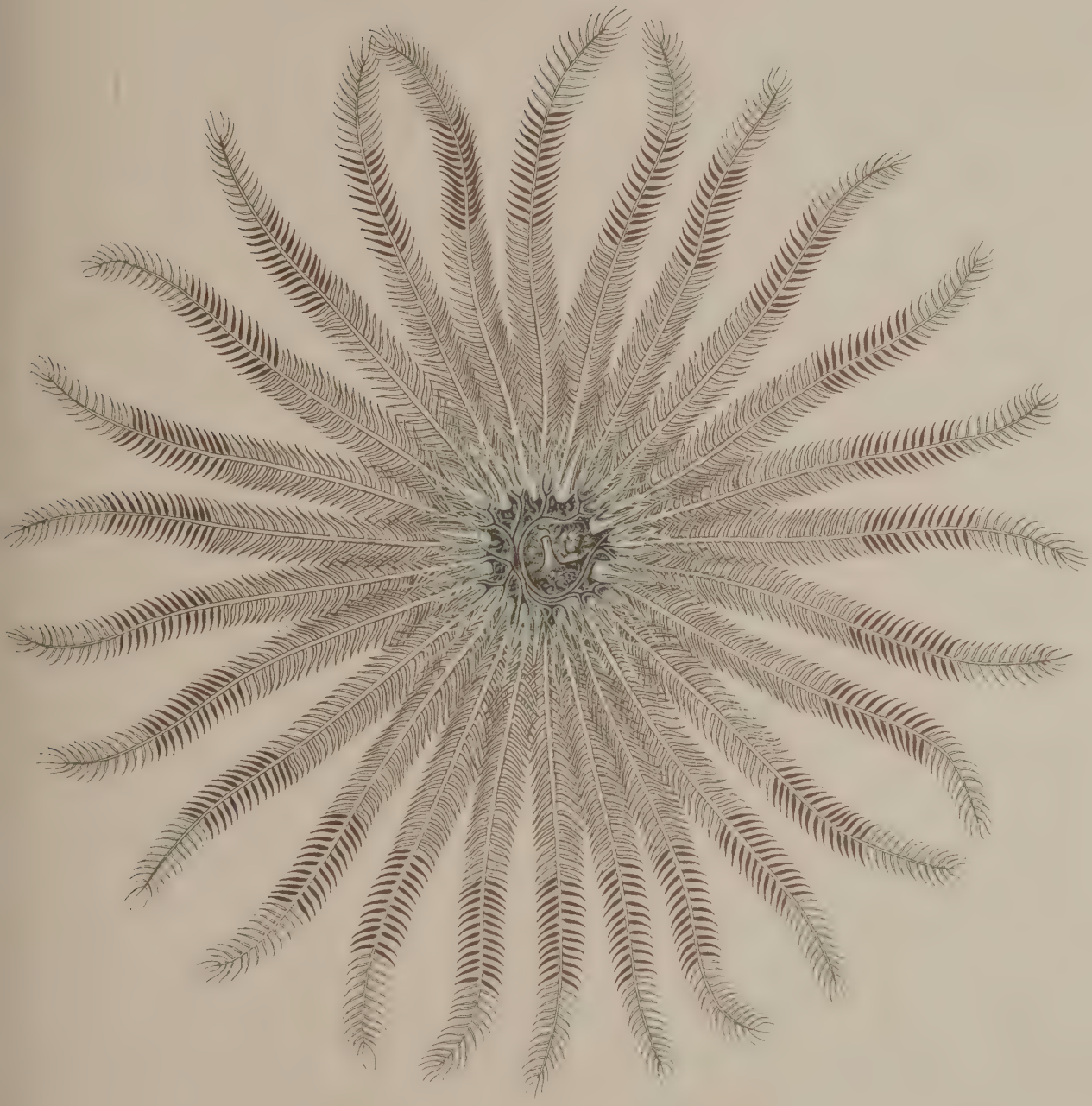


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PLATE V.

Homalometra denticulata. Lateral view of a specimen with eleven arms from Stat. 167. Twice natural size.

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PLATE VI.

Amphimetra discoidea. Ventral view of a specimen from Stat. 99. Natural size.

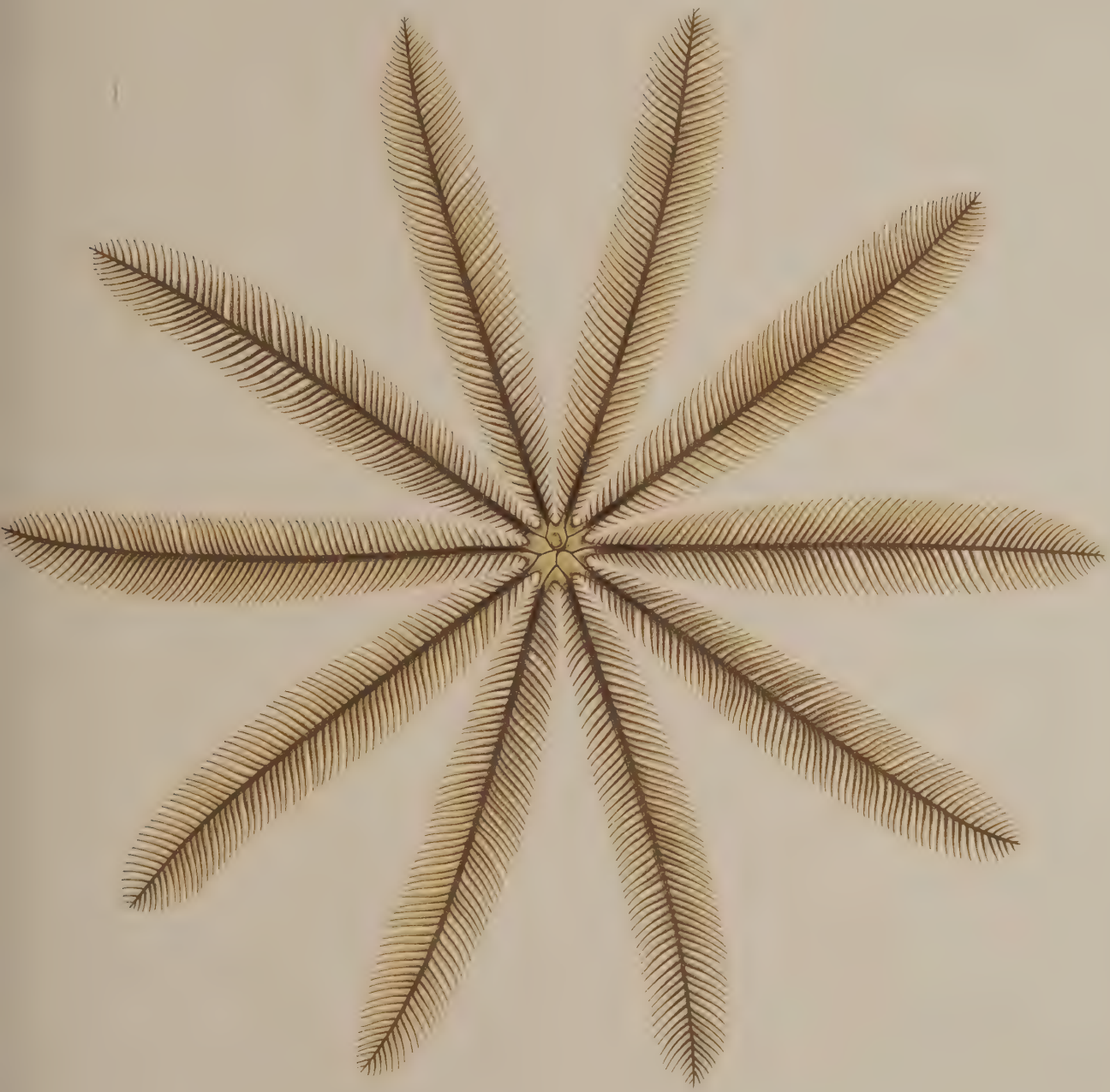

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PLATE VII.

Stephanometra spicata. Ventral view of a specimen with twenty arms from Stat. 99. Natural size.

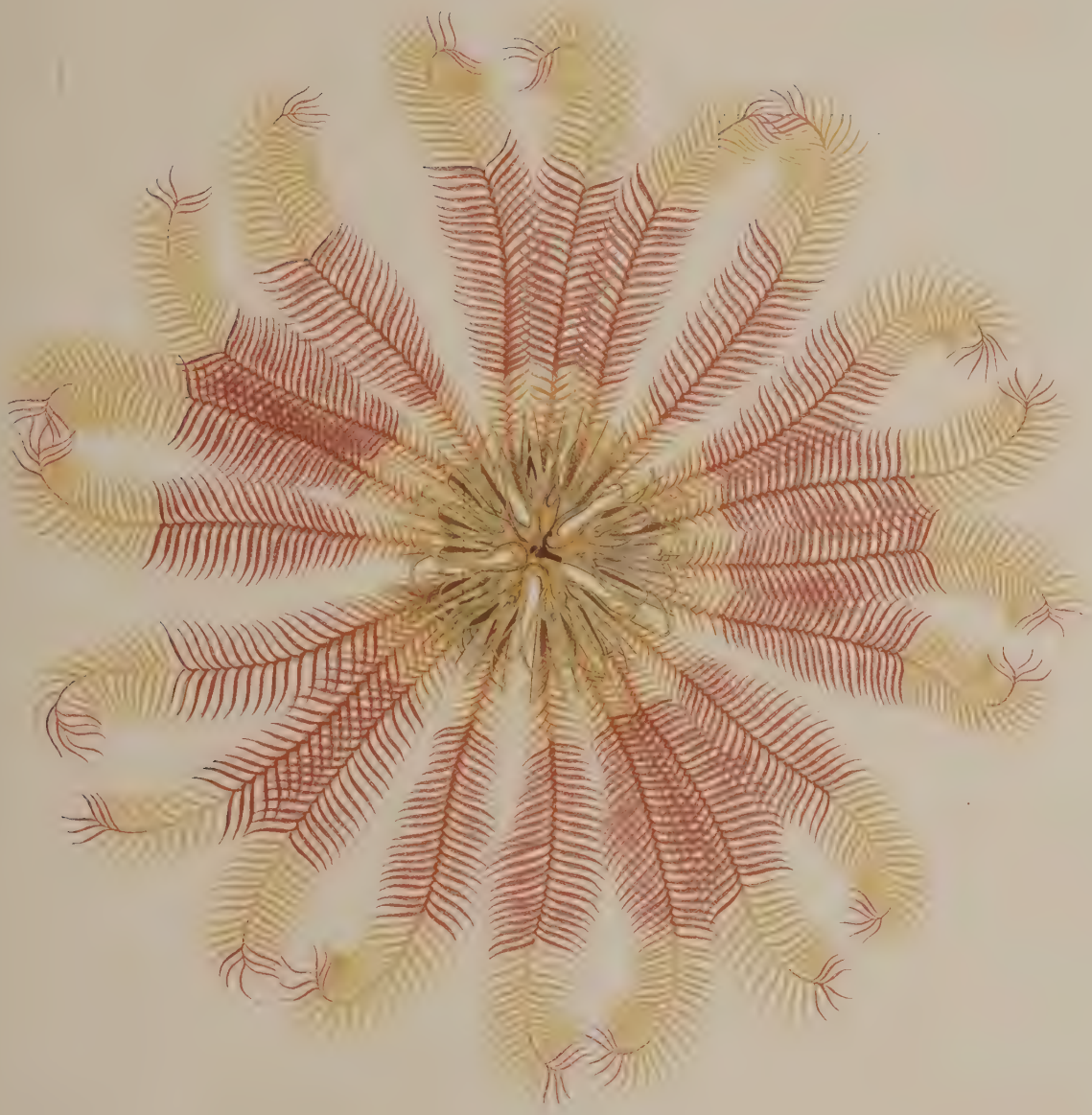

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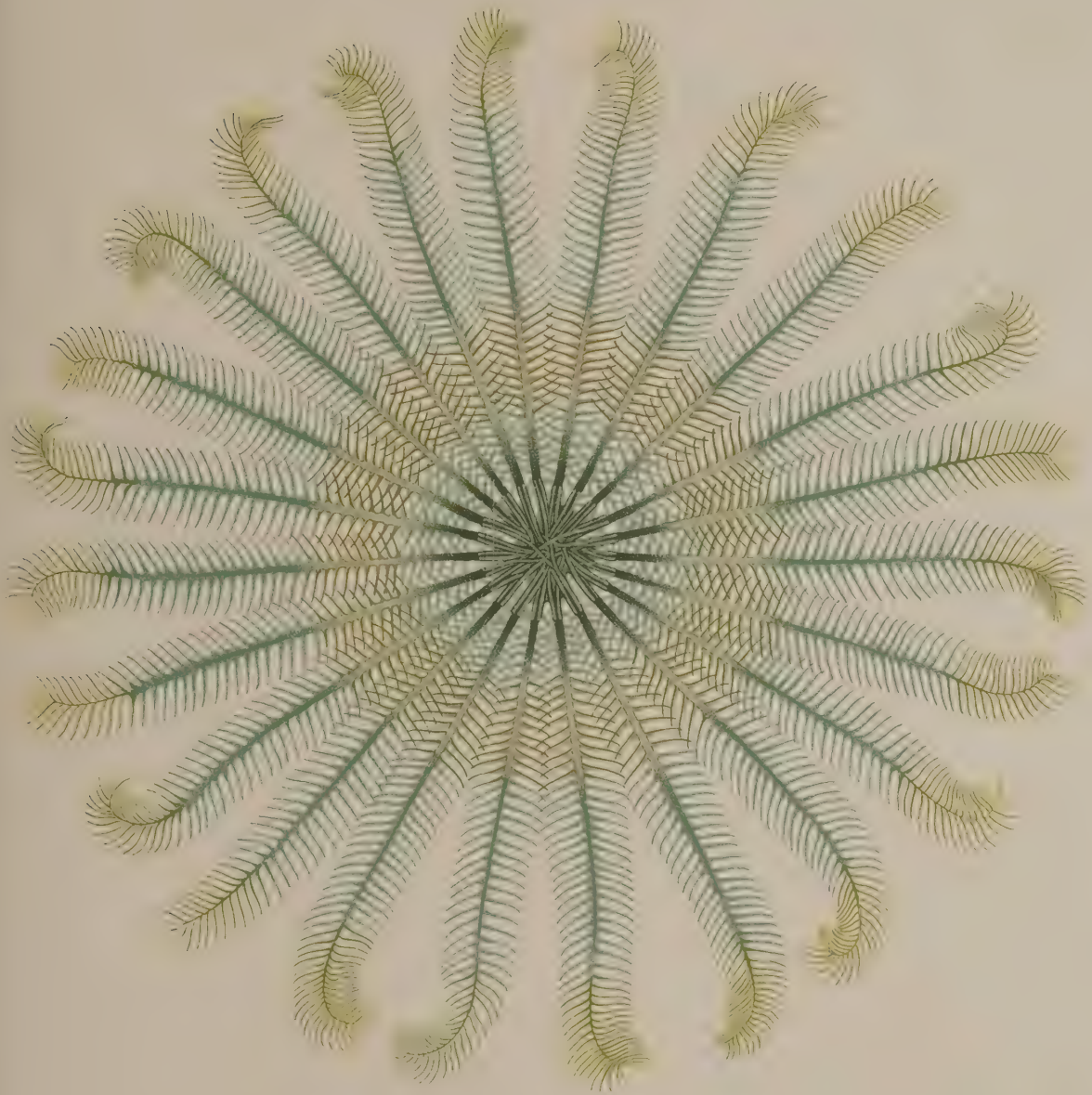
PLATE VIII.

Lamprometra protectus. Ventral view of a specimen with twenty-three arms from Stat. 125. Natural size.



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Fa. P. W. M. Trap impr.

PLATE IX.

Pterometra pulcherrima. Ventral view of a specimen with twenty arms from Stat. 144. Natural size.

Decker del.

Fa. P. W. M. Trap impr.

PLATE X.

The original of this plate was lost on its voyage from Washington to Holland and will be delivered later.

PLATE XI.

Fig. 1. *Palaeocomatella difficilis*: dorsal view of the specimen from Stat. 105. × 3.
Fig. 2. *Palaeocomatella difficilis*: ventral view of the same specimen. × 3.
Fig. 3. *Capillaster gracilicirra*: lateral view of the type specimen from Stat. 320. × 2.
Fig. 4. *Capillaster macrobrachius*: dorsal view of the specimen from Stat. 77. × 2.
Fig. 5. *Capillaster macrobrachius*: ventral view of the same specimen. × 2.

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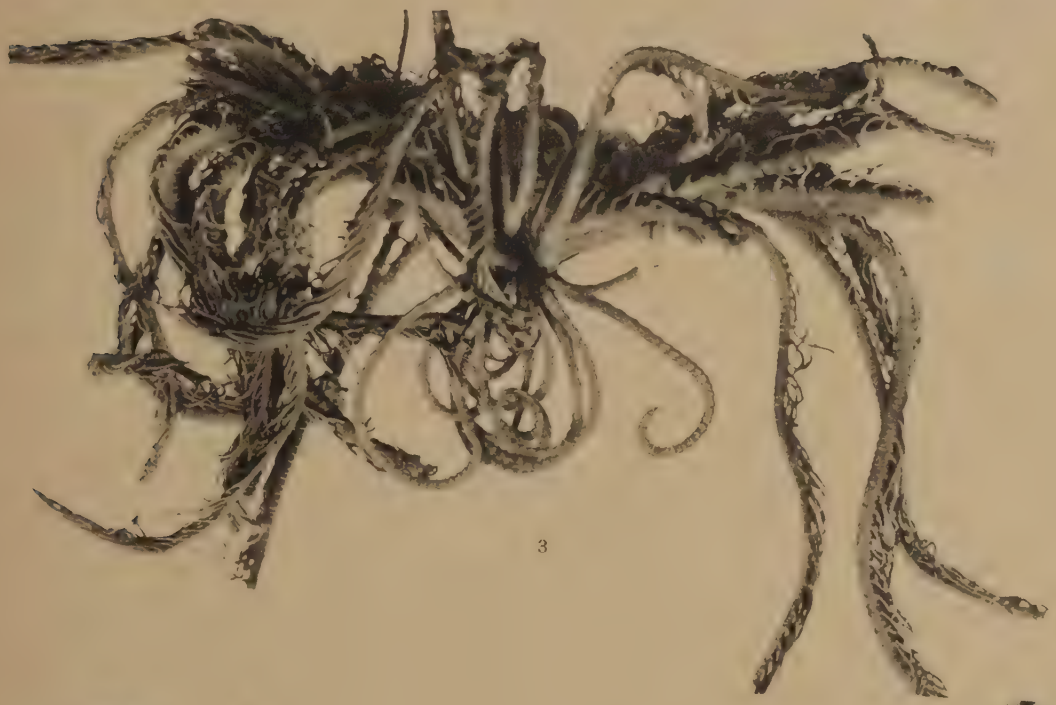

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PLATE XII.

Fig. 6. *Capillaster tenuicirra:* dorsal view of the type specimen from Stat. 320. × 2.
Fig. 7. *Comissia littoralis*: dorsal view of the type specimen from Stat. 129, reef. × 2.
Fig. 8. *Comissia littoralis*: ventral view of the same specimen. × 2.

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PLATE XIII.

Fig. 9. *Comissia parvula*: dorsal view of a specimen from an unknown locality. × 3.
Fig. 10. *Comissia gracilipes*: dorsal view of one of the cotypes from Stat. 267. × 3.
Fig. 11. *Comissia gracilipes*: dorsal view of the other cotype from Stat. 267. × 3.
Fig. 12. *Comissia spinosissima*: ventral view of the type specimen from Stat. 305. × 3.
Fig. 13. *Comissia spinosissima*: dorsal view of the same specimen. × 3.

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PLATE XIV.

Fig. 14. *Comaster pulcher*: dorsal view of the type specimen from Stat. 257. × 2.
Fig. 15. *Comaster pulcher*: ventral view of the same specimen. × 2.
Fig. 16. *Comatula purpurea*: dorsal view of a four-rayed specimen from Stat. 273. Natural size.
Fig. 17. *Comaster sibogae*: dorsal view of the type specimen from Stat. 318. Natural size.
Fig. 18. *Comaster delicata*: dorsal view of the specimen from Stat. 282. × 2.

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PLATE XV.

Fig. 19. *Comatula tenuicirra*: dorsal view of the type specimen from Stat. 320. × 2.
Fig. 20. *Comatula tenuicirra*: ventral view of the same specimen. × 2.
Fig. 21. *Comatulides australis*: dorsal view of the type specimen from Stat. 297. × 2.
Fig. 22. *Comatulides australis*: ventral view of the same specimen. × 2.

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PLATE XVI.

Fig. 23. *Comaster minimus*: dorsal view of the specimen from Stat. 302. × 2.
Fig. 24. *Comantheria weberi*: dorsal view of the type specimen from Stat. 49ª. Natural size.
Fig. 25. *Comanthus bennetti*: dorsal view of a young specimen (the type of *Comanthus crassicirra*) from Stat. 133. Natural size.
Fig. 26. *Comantheria rotula*: dorsal view of the type specimen from Stat. 273. Natural size.

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PLATE XVII.

Fig. 27. *Eudiocrinus venustulus*: lateral view of a specimen from Stat. 294. × 3.
Fig. 28. *Eudiocrinus venustulus*: dorsal view of another specimen from Stat. 294. × 3.
Fig. 29. *Eudiocrinus ornatus*: lateral view of a specimen from Stat. 294. × 2.
Fig. 30. *Eudiocrinus pinnatus*: lateral view of the type specimen from Stat. 310. × 2.
Fig. 31. *Eudiocrinus junceus*: dorsal view of the type specimen from Stat. 167. × 2.
Fig. 32. *Eudiocrinus junceus*: ventral view of the same specimen. × 2.

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PLATE XVIII.

Fig. 33. *Heterometra propinqua*: lateral view of the type specimen from Stat. 318. × 2.
Fig. 34. *Heterometra propinqua*: opposite side of the same specimen. × 2.
Fig. 35. *Amphimetra discoidea*: dorsal view of a four rayed specimen from Stat. 273. × 2.
Fig. 36. *Amphimetra jacquinoti*: lateral view of a specimen from the Bay of Pidjot, Lombok. Natural size.

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PLATE XIX.

Fig. 37. *Oxymetra tenuicirra*: lateral view of the type specimen from Stat. 320. Natural size.
Fig. 38. *Oxymetra tenuicirra*: opposite side of the same specimen. Natural size.
Fig. 39. *Dichrometra tenuicirra*: dorsal view of a specimen from Stat. 320. × 2.
Fig. 40. *Zygometra punctata*: ventral view of a specimen from Stat. 273. × 2.
Fig. 41. *Zygometra punctata*: dorsal view of another specimen from Stat. 273. × 2.

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PLATE XX.

Fig. 42. *Decametra laevipinna*: lateral view of a specimen from Saleyer. × 2.
Fig. 43. *Decametra laevipinna*: lateral view of a detached arm from a specimen from Saleyer, showing the pinnules. × 3.
Fig. 44. *Mariametra tuberculata*: dorsal view of the type specimen from Stat. 51 (69—91 Metres). × 2.
Fig. 45. *Decametra minima*: lateral view of a specimen from Stat. 117. × 3.
Fig. 46. *Decametra parva*: lateral view of the type specimen from Stat. 315. × 2.
Fig. 47. *Mariametra tenuipes*: dorsal view of the type specimen from Stat. 294. × 2.
Fig. 48. *Cyllometra gracilis*: dorsal view of a specimen from Stat. 49ª. × 2.
Fig. 49. *Oligometrides adeonae*: ventral view of a young specimen (the type of *O. marginata*) from Stat. 305. × 2.
Fig. 50. *Decametra mylitta*: lateral view of a specimen from Stat. 99. × 2.

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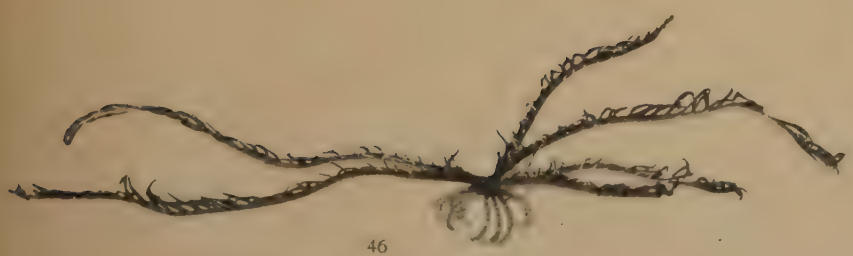
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PLATE XXI.

Fig. 51. *Neometra sibogae*: dorsal view of one of the cotypes from Stat. 305. × 2.
Fig. 52. *Neometra sibogae*: ventral view of the same specimen. × 2.
Fig. 53. *Aglaometra sulcata*: lateral view of the type specimen from Stat. 161. Natural size.
Fig. 54. *Aglaometra vera*: lateral view of the type specimen from Stat. 173. Natural size.

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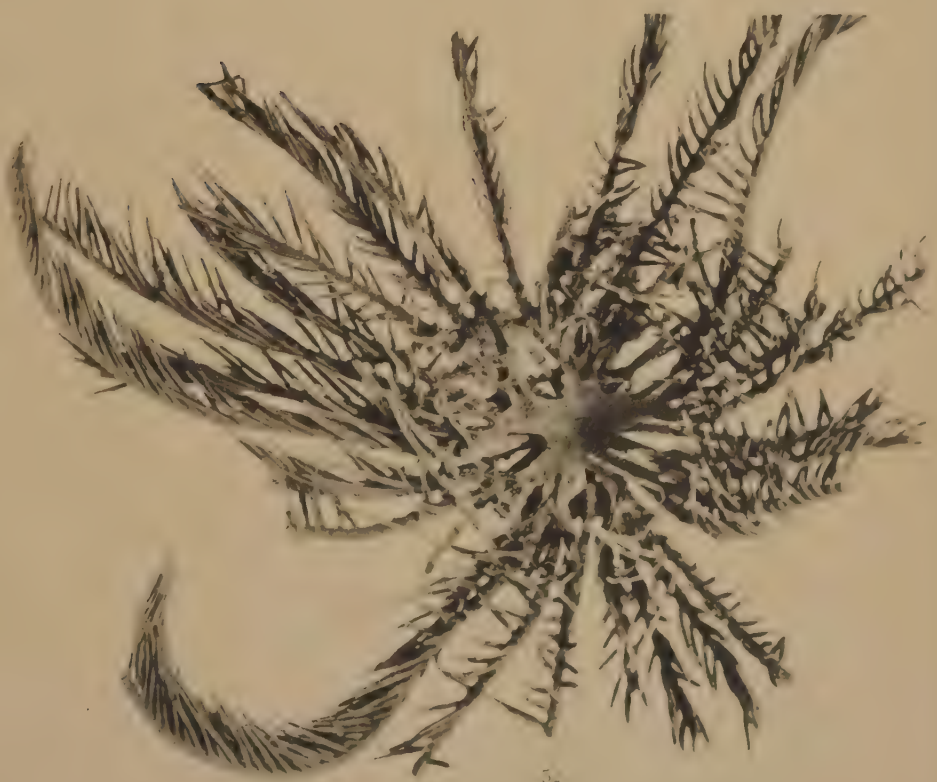

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PLATE XXII.

Fig. 55. *Neometra diana*: dorsal view of the type specimen from Stat. 294. × 2.
Fig. 56. *Neometra diana*: lateral view of the same specimen. × 2.
Fig. 57. *Oceanometra magna*: dorsal view of the type specimen from Stat. 251. Natural size.
Fig. 58. *Thalassometra margaritifera*: lateral view of the type specimen from Stat. 226. × 2.
Fig. 59. *Pterometra venusta*: dorsolateral view of one of the cotypes from Stat. 117. × 2.

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PLATE XXIII.

Fig. 60. *Daidalometra arachnoides*: lateral view of a specimen (the type of *Stenometra acuta*) from Stat. 294. × 2.

Fig. 61. *Cosmiometra philippinensis*: lateral view of a specimen (the type of *Cosmiometra helene*) from Stat. 253. × 2.

Fig. 62. *Crotalometra marginalis*: lateral view of the type specimen from Stat. 226. × 2.

Fig. 63. *Stiremetra perplexa*: lateral view of the type specimen from Stat. 211. × 2.

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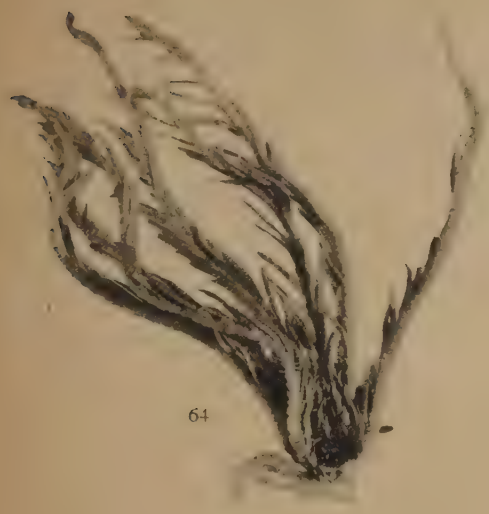
PLATE XXIV.

Fig. 64. *Strotometra priamus*: lateral view of a specimen from Stat. 266. × 2.
Fig. 65. *Strotometra priamus*: opposite side of the same specimen. × 2.
Fig. 66. *Perissometra crassa*: dorsolateral view of the type specimen from Stat. 259. Natural size.
Fig. 67. *Crossometra helius*: lateral view of the type specimen from Stat. 254. Natural size.
Fig. 68. *Monachometra fragilis*: lateral view of the type specimen from Stat. 166. Natural size.
Fig. 69. *Monachometra fragilis*: opposite side of the same specimen. Natural size.
Fig. 70. *Strotometra ornatissima*: dorsal view of the type specimen from Stat. 122. × 2.
Fig. 71. *Perissometra timorensis*: lateral view of the type specimen from Stat. 297. Natural size.



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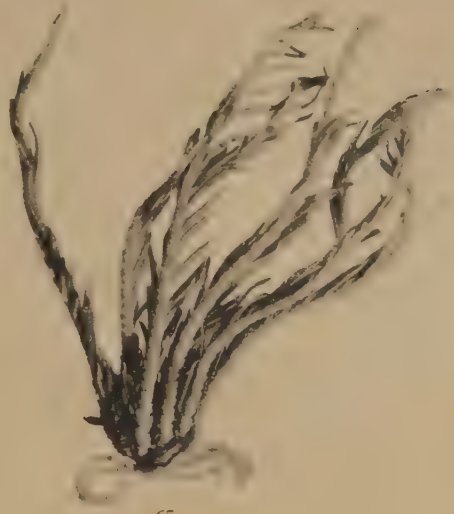

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PLATE XXV.

Fig. 72. *Euantedon moluccana*: dorsal view of the type specimen from Stat. 139. × 2.
Fig. 73. *Euantedon moluccana*: lateral view of the same specimen. × 2.
Fig. 74. *Compsometra longicirra*: dorsal view of the type specimen from Stat. 167. × 3.
Fig. 75. *Compsometra longicirra*: ventral view of the same specimen. × 3.
Fig. 76. *Eumetra aphrodite*: dorsal view of a specimen from Stat. 294. × 2.
Fig. 77. *Compsometra iris*: lateral view of the type specimen from Stat. 144. × 2.
Fig. 78. *Compsometra iris*: opposite side of the same specimen. × 2.
Fig. 79. *Compsometra longicirra*: lateral view of a specimen (the type of *C. gracilipes*) from Stat. 50, reef. × 3.
Fig. 80. *Compsometra parviflora*: dorsal view of a specimen from Stat. 50. × 3.
Fig. 81. *Compsometra parviflora*: ventral view of the same specimen. × 3.
Fig. 82. *Toxometra paupera*: lateral view of a specimen (the type of *T. purpurea*) from Stat. 96. × 2.
Fig. 83. *Toxometra paupera*: dorsal view of the same specimen. × 2.

72

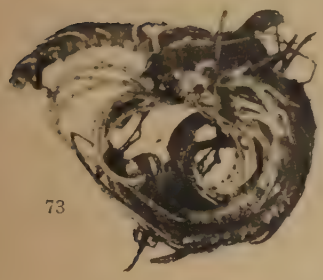
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PLATE XXVI.

Fig. 84. *Nanometra clymene*: lateral view of the type specimen from Stat. 253 with, at the left, a detached arm showing the pinnules. Natural size.
Fig. 85. *Fariometra dione*: lateral view of the type specimen from Stat. 85. × 2.
Fig. 86. *Nepiometra alcyon*: lateral view of the type specimen from Stat. 251. × 2.
Fig. 87. *Psathyrometra major*: lateral view of the type specimen from Stat. 45. × 2.
Fig. 88. *Psathyrometra inusitata*: lateral view of the type specimen from Stat. 45. × 2.
Fig. 89. *Psathyrometra inusitata*: dorsal view of the same specimen. × 2.
Fig. 90. *Psathyrometra anomala*: lateral view of the type specimen from Stat. 211. × 3.
Fig. 91. *Psathyrometra minima*: lateral view of the type specimen from Stat. 48. × 3.
Fig. 92. *Tonrometra brevipes*: lateral view of the type specimen from Stat. 150. × 3.
Fig. 93. *Fariometra scudifera*: lateral view of the type specimen from Stat. 119. × 2.
Fig. 94. *Atelecrinus sulcatus*: lateral view of the type specimen from Stat. 85. × 2.
Fig. 95. *Atopocrinus sibogae*: lateral view of the type specimen from Stat. 177. Natural size.
Fig. 96. *Atelecrinus anomalus*: lateral view of the type specimen from Stat. 177. × 3.
Fig. 97. *Nepiometra io*: lateral view of the type specimen from Stat. 211. × 3.
Fig. 98. *Thaumatometra thysbe*: lateral view of the type specimen from Stat. 52. × 3.

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PLATE XXVII.

Fig. 99. *Lamprometra protectus*: ventral view of a specimen from Stat. 115, reef. Natural size.
Fig. 100. *Lamprometra protectus*: dorsal view of the same specimen. Natural size.
Fig. 101. *Homalometra denticulata*: lateral view of the specimen from Stat. 167. × 2.
[Plate V is a copy in colours of this photograph.]
Fig. 102. *Homalometra denticulata*: the opposite side of the same specimen, showing the proximal pinnules. × 2.

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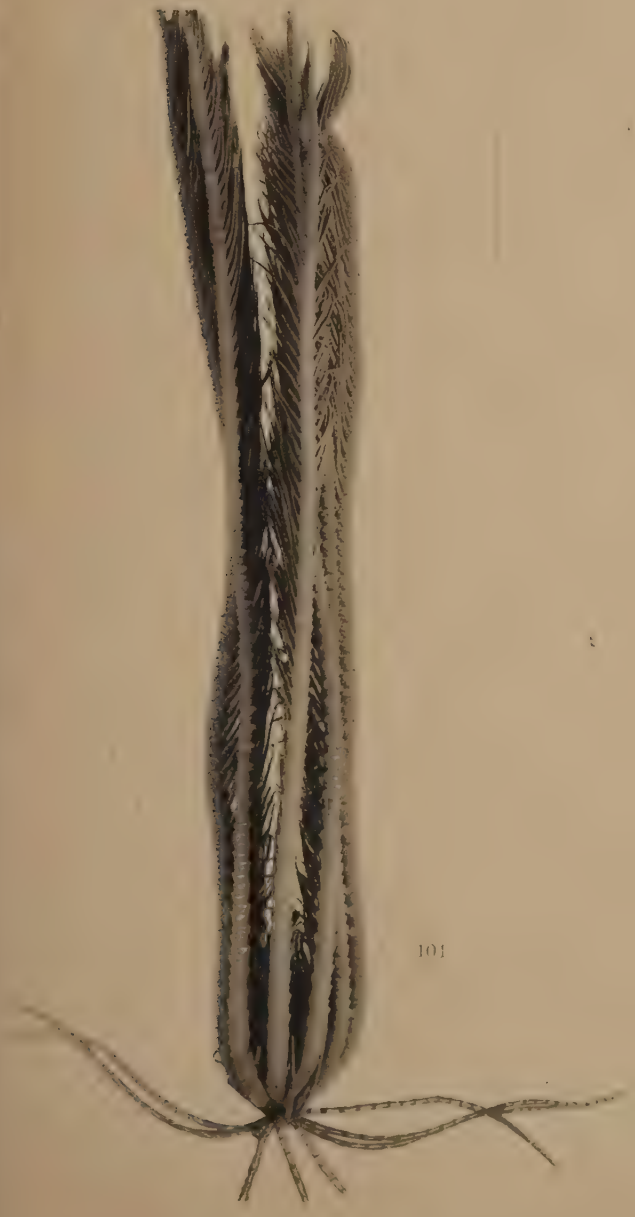

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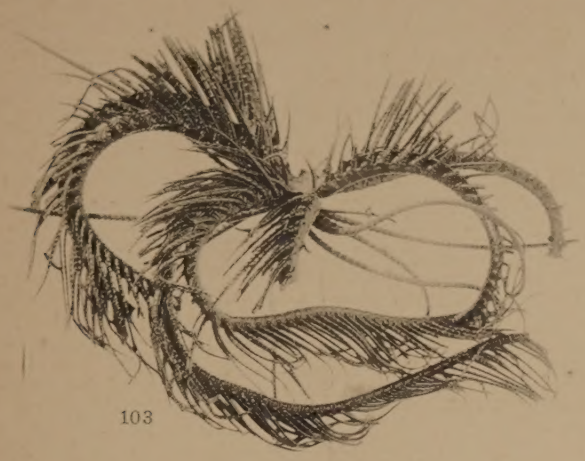
PLATE XXVIII.

Fig. 103. *Colobometra perspinosa*: lateral view of a specimen from Banda, 9--36 Metres. Natural size.
Fig. 104. *Pterometra pulcherrima*: ventral view of the specimen from Stat. 144, 45 Metres. Natural size.
[Plate IX is a copy in colours of this photograph.]
Fig. 105. *Oligometra carpenteri*: ventral view of a specimen from Stat. 274. × 2.
Fig. 106. *Tropiometra afra*: lateral view of the specimen from Stat. 164. Natural size.
Fig. 107. *Oligometrides adeonae*: lateral view of a specimen from Stat. 273. × 2.
Fig. 108. *Oligometrides adeonae*: a detached arm pair from the same specimen. × 2.
Fig. 109. *Oligometrides adeonae*: the same arm pair reversed to show the proximal pinnules. × 2.
Fig. 110. *Cotylometra gracilicirra*: lateral view of the specimen from Stat. 305. × 2.



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